P

21

Sensori motor actions

Cephalic Nerves

Cerebral Hemispheres

Gilbert's book, with cerebrum removed.

Dr Mesnet's automata

Man.

Dim.

Reeves & Altrices

Chicken pup!

Spalding: Instinct is hereditary habit; but some instinctive acts congenital. "Lapsed intelligence" Leves. Memory of the race, &c &c. Some instincts acquired by training. Hounds &c.

Commering makes 12 pairs; a natural division. First 6, same as the ordinary. VII, facial; VIII, auditory; IX glossopharyngeal; X, pneumogastric; XI, spinal accessory; XII, hypoglossal.

The Acoustic Nerve.

M. Cyon recently read a paper before the Academy of Sciences in Paris, which was designed to show the physiological relations existing between the acoustic nerve and the motor apparatus of the eye. The conclusion of this memoir may be summed up as follows: 1. Disturbances in the motor apparatus, occasioned by operations on the semicircular canals, are not produced in a uniform manner in animals of different species; in frogs, these disturbances are limited almost exclusively to the vessels of the trunk; in pigeons, the muscles of the head are principally affected; in rabbits the disturbances are specially those of the muscles of the eye. 2. The opinion lately maintained by M. Goltz and M. Cyon, and accepted by the majority of physiologists, that the loss of equilibrium which supervenes on the section of the semicircular canals is caused by the erroneous ideas conceived by the animal operated on regarding the position of its head in space, can no longer be maintained. 3. The movements of the eyeball are not compensatory movements; they are the direct and immediate consequence of the lesion of the canals. 4. By the excitation of the horizontal canal in the rabbit, a rotation of the eye on the same side is produced, so that the pupil becomes directed backward and downward; that of the posterior vertical canal produces a deviation of the eye, with the pupil directed forward and a little upward; that of the anterior vertical canal backward and downward. 5. The excitation of a canal always produces ocular movements in both eyes; but, in the eye of the side opposite to the injured canal, movements in a contrary direction to those of the eye of the other side take place. 6. The pupil contracts on the side on which the excitation takes place, and remains dilated on the opposite side. At the very moment of the excitation, the contraction of the motor muscles of the eyeball has a tetanic character. 7. The oscillatory movements disappear when the acoustic nerve of the opposite side is divided. Fresh excitations of a semicircular canal no longer produce anything except tetanic excitations. The excitation of an acoustic nerve produces violent rotations of the two eyeballs. 8. The division of an acoustic nerve induces a strong deviation of the eyeball of the same side, so that the pupil becomes directed downwards, whilst on the other side the eye is carried upwards. This deviation disappears after the section of the second acoustic nerve. 9. The movements of the head and trunk observed in pigeons after the lesion of the semicircular canals, are described in a very precise manner by Flourens in his classic writings.—*London Med. Record*, June 15, 1876.

5. [illegible] doses in inflammatory diseases.

6. It should be given in small doses in chronic affections where there is exudation.—*London Med. Record*, June 15, 1876.

—

On Cotton Dressing and Tannin Dressing.

Herr Graf, of Elberfeld, in the course of some remarks on the treatment of wounds at the Fifth Congress of the Society of German Surgeons, said that he did not intend to speak of the modifications introduced into Lister's method by Thiersch, Bardeleben, and Volkmann, with a view to its simplification, but of the cotton-wool and tannin dressings. The earliest notice of the cotton-wool dressing, as far as he had been able to ascertain, was by Professor Burggraeve, whose method was warmly advocated by Ravoth. It consisted essentially in the immediate application of splints thickly padded with cotton to the injured limb, and aimed especially at securing immobility without taking notice of any wound that was present. It was, therefore, not applicable to the more extensive injuries of skin and destructions of tissue, and was not used in injuries of the hands and fingers, for example. The most important and promising modification of this was the cotton-dressing designed by Hermann Schulte, and described by him in the *Medicinische Centralzeitung* for 1857, and the *Deutsche Klinik* for 1860. While Burggraeve allowed his splints to remain applied as long as possible, Schulte insisted on the examination of the wound after a time. He laid on the injured limb a layer of cotton-wool from 1½ to 2 inches thick; this also covered the wound and was secured by a bandage. After this, splints lined with cotton-wool were applied. The cotton-wool and blood became felted and dried, or, if there were bleeding of moderate duration, the dressing became saturated with blood; the cotton-wool around the limb, however, becoming dry, and only that over the wound remaining moist. This dressing was changed after four or six days. If there were neither inflammation nor suppuration, and there were a firm scab, it was left alone and only the surrounding cotton-wadding was removed. If suppuration were present, the part was dressed with cerate, and plaster of Paris was applied, etc. The principle of Schulte's plan was, then, the methodical application of so-called healing by scabbing, extended to large wounds. The disadvantage attending the plan, that the dressings not unfrequently became saturated within the first few days with blood, led Dr. Graf to use a combination of cotton-wool with tannin. The side of the cotton-wadding turned towards the wound was covered with a layer of tannin as thick as the back of a knife, and the dressings were applied as

The *tubercula quadrigemina* are the principal terminations of the *optic nerves;* the latter, however, sending filaments also to the thalami.

The reason for the close contiguity and connection between these different sensorial centres, and between them and the corpora striata, as well as between them and the spinal marrow below and the cerebral hemispheres above, is explained by the facts of what is called *sensori-motor guidance.* Every voluntary action is guided by a sensation; walking, speaking, writing, playing upon an instrument, working with tools. If one shuts his eyes and tries to walk a plank, he will almost certainly fail. Even the disturbance of vision which attends looking down from a great height may render walking dangerous, though otherwise safe. All confused or unusual impressions make actions uncertain. *Mutes* are commonly so because born *deaf.* Those who become deaf after learning to talk, retain speech. For musical performance one must have a good *ear;* for painting or sculpture, a good visual perception and discernment.

Some sensori-motor (reflex) actions are involuntary; as, winking, sneezing. Common acts, as walking, may become so, when habitual, though at first requiring attention and will. Blind persons exemplify the guidance of diverse sensations; instead of sight, they walk by hearing and touch. Sensori-motor actions under morbid causes often occur; as coughing, vomiting, hysterical convulsions. *Instincts* are, all of them, sensori-motor impulses and actions, more or less voluntary.

Cranial or Cephalic Nerves.

Anatomists still number these as nine on each side. Functionally, a very different classification might be made out. Comparing them, in plan of arrangement, to the spinal nerves, Dr. Dalton gives the following table:—

CRANIAL NERVES.

NERVES OF SPECIAL SENSE.

1. Olfactory. 2. Optic. 3. Auditory.

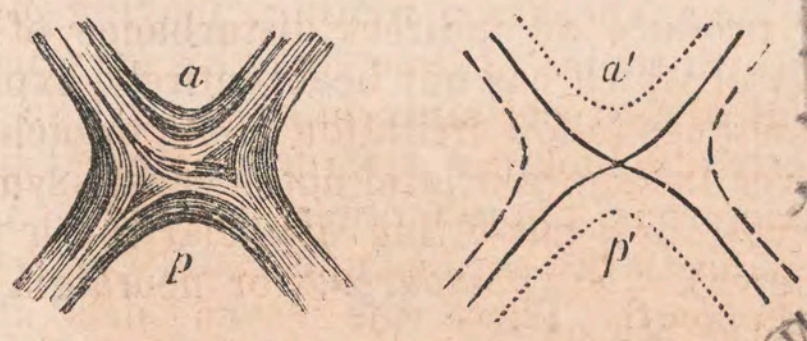
	Motor Nerves.	*Sensitive Nerves.*
1st Pair	Motor oculi communis Patheticus Motor oculi externus Small root of 5th pair Facial	Large root of 5th pair.
2d Pair	Hypoglossal.	Glosso-pharyngeal.
3d Pair	Spinal Accessory.	Pneumogastric.

Following the common enumeration, the functions of the different nerves may be briefly described:—

1*st pair. Olfactory nerve.*—Peculiar in having a bulb at its anterior extremity, which is apparently the true ganglionic portion.

2*d pair. Optic nerve.*—Remarkable for the *chiasm* or union of the two optic nerves, by which an entire unity of the visual image is produced, from the two actual images, one on each retina.

Fig. 147.



CHIASM OF OPTIC NERVES.

3*d pair. Motor oculi communis.*—All the muscles of the eyeball ~~(four *recti* and two *obliqui*)~~ are supplied by this nerve; also, the *levator palpebræ*, and the *iris*. Besides the simple ordinary movements of the eyeball, therefore, the opening of the eye and the contraction of the pupil are controlled by it.

4*th pair. Patheticus.*—Only the superior oblique muscle is supplied with motor influence by this nerve.

6*th pair. Motor externus.*—The external rectus muscle of the eyeball receives all the terminations of this. It is sometimes called *abducens oculi.*

7*th pair. Portio dura; Facial nerve.*—This is the *motor* nerve of the superficial muscles of the face; including the orbicularis oculi. When it is paralyzed, which happens sometimes from exposure to cold, the lower eyelid falls, and so does the corner of the mouth; and all expression of that side of the face is lost.

The sensibility which belongs to some branches of this nerve over the face is derived entirely from the union in the same sheaths of filaments from the *fifth* nerve; the seventh is altogether motor.

Portio mollis of 7th pair; *Auditory nerve.*—To this belongs exclusively the conveyance of impressions of sound from the ear to the base of the brain.

9*th pair. Hypoglossal.*—Being distributed to the tongue, this is the *motor* nerve of that organ.

Having thus disposed of the simpler nerves of the series, the *complex* ones remain to be considered. They are the 5th and 8th.

5*th pair. Trifacial, or Trigeminus.*—Like the spinal nerves, the 5th has two roots; an anterior, smaller, motor, and a posterior larger, sensory root. The latter also has a ganglion upon it, the ganglion of Casser.

After the ganglion, the trunk of the nerve divides into three

LOCAL AFFAIRS.

TESTS IN "MIND READING" AT CONCERT HALL.—Mr. J. B. Brown's first public demonstration of what is called "mind reading" was given at Concert Hall last evening before a large and manifestly intelligent audience. Mr. Brown was introduced to the audience by Dr. J. W. White, who stated that Mr. Brown claimed to have the faculty of reflecting the thoughts in the mind of any other person at the moment when he (Mr. B.) was in physical contact with such person, and that Mr. Brown would present to the audience certain tests as to his possession of that faculty. As a preliminary, he requested the audience to nominate a committee of four persons to supervise the proceedings, so as to prevent anything like collusion. The following gentlemen were nominated: W. V. McKean, C. H. Muirheid, Daniel Dougherty, Professor John Neill of the University, Professor Allen and Professor Henry Hartshorne of Haverford College. Mr. Muirheid and Professor Allen asked to be excused, and the other four consented to serve.

The first test proposed by Mr. Brown, was that an article should be secreted by a person selected from the audience by the committee, and he would find the place where the article was hid. For this experiment, Prof. J. W. Wilson, of the High School, was selected from the audience. Mr. Brown was taken from the platform into a back room by two members of the committee, and kept there seated, with his back to the closed door which led to the platform. When informed that the article was secreted, Mr. Brown was led back blindfolded, and, after telling Mr. Wilson to keep his mind fixed on the object, he was placed in contact with Prof. Wilson, whose left hand he took in his own left hand, and placing his right hand for a moment on the Professor's forehead, made a few passes back and forth between his own head and the subject's, and then placing Professor Wilson's left hand on his (Mr. B.'s) forehead for a moment or two, he suddenly darted down the steps leading from the platform to the audience, and along the centre aisle up and down, pausing occasionally, until at last he began groping about with his head near the floor and picked up the object which the Professor had left there. It was a glass taken out of a pair of spectacles, which Professor Wilson had, in passing up and down the aisle, purposely dropped at that spot.

The successful result of this test was greeted with applause. The next test was to "designate a person in the audience who was thought of by another person selected from the audience." Hon. Allison White was selected by the committee as the subject for this experiment. He came upon the platform, and the same manipulation was gone through as before, when Mr. Brown, darting off suddenly, went back and forth along the aisles until at last he paused before Professor W. H. Allen, of Girard College, and placing his hand on Professor Allen's head, said "This is the gentleman you thought of," and this, Mr. White said, was entirely correct, when there was renewed applause.

The third experiment was to test Mr. Brown's power to "follow out a route through the building, which was simply *thought of* by a person in the audience." Professor Allen was selected by the committee to conduct this. Proceeding as before, Mr. Brown, blindfolded, led Professor Allen rapidly down from the platform, and then, after a momentary hesitation, conducted him along the centre aisle to the far end, then back, then across the north aisle to the west aisle, half way down that and back, thence back to the eastern aisle, half way up that and back, thence back to the platform. This, Professor Allen said, was strictly right as the route he had in his mind, which announcement was greeted with prolonged applause.

Next came the test of locating a real pain felt by any person in the audience, in any part of the body, which was done successfully in the case of a gentleman whose name was not announced. Mr. Brown was then subjected to an extraordinary test, which the committee had at first rejected as not coming precisely within the terms. The subject in this instance was Dr. M. Price, of the Philadelphia Dispensary, who said that the pain was accurately located by Mr. Brown. The extraordinary part of it was that Dr. Price had in his mind a fanciful pain in the great toe of the right foot, which foot and leg below the knee had been amputated several years ago. There are many cases in the medical books of such imaginary pains in amputated limbs; but whilst the experiment was going on Dr. Price said he experienced a *real pain* at the end of the stump of the amputated leg, which led his mind to that, and that was the precise spot where Mr. Brown located the pain. The announcement of this was received with loud applause.

A purely imaginary pain was then located in the right side of the right ankle of Mr. D. T. Pratt, the well-known conveyancer, who had been selected by the committee as the subject.

The next was a crucial "triple test," which may be described as follows: The committee were to select a person from the audience, who was to hand some object to a second person in the audience, and he in turn was to hand it to a third, who was to secrete it anywhere, and neither of the first two was to know what had become of the object. Mr. Brown was then to find the article so secreted. The Hon. Horatio Gates Jones was selected as the first of the three persons. Mr. Brown was then taken out of the hall, when Mr. Jones crossed the hall, giving the article to Mr. H. P. Muirheid, conveyancer, who in turn gave it to Mr. Richard S. Smith, President of the Delaware Mutual Insurance Co., who in his turn handed it to Mr. Alex. Biddle, who secreted it. Mr. Brown, blindfolded, taking Mr. Jones with him, soon found Mr. Muirheid, then dropping Jones he took Muirheid by the hand and soon found Mr. Smith, when dropping Muirheid in turn he took Smith by the hand, and after going rapidly along the aisles and among the benches, passing near to Mr. Biddle, he gave up the search, asking for another subject. It turned out that Mr. Smith, who ought to have known where the object was hid, did not know what became of it after he handed it to Mr. Biddle, and so did not have the locality in his mind. The experiment was therefore successful only so far as finding the two persons to whom the object had been passed after it left Mr. Jones.

It was then suggested that Mr. Brown should find or designate some object indicated to the audience in his absence, which object was to be known to the audience by showing it, and also its hiding place to all present. This might be done with any object in sight or within reach of the audience.

Prof. Hartshorne then put a minute pocket microscope in his vest pocket, and standing on the stage when Mr. Brown returned, allowed Mr. Brown to search for it. Two or three times Mr. Brown put his head on the pocket containing the microscope, but finally gave up the search. Another subject, Mr. A. B. Burk, of the Ledger staff, was then tried, and acting through the latter as the subject, Mr. Brown found the pocket containing the microscope, and then selected from a number of articles contained in that pocket, the particular one in the mind of the subject, the articles having first been taken from the pocket and laid out in Prof. Hartshorne's hands.

☞ hold a meeting for the [illegible] officers THIS EVENING, 15th inst., at 8 o'clock, Pennsylvania Hall, Eighth street, below Gree About fifty lots are still for sale. The ground this Company is near first class improvements, the lower end of Germantown, and selling at th rale of $1 per foot—only one-half the price of othe lots in the neighborhood. Call at the Office of J. E SIDDALL & SON, 209 South Fifth street, for plan prospectus, and to subscribe for shares previous the meeting. By order of

*424 JOHN J. CROUT, President pro tem.

☞ NEW SERIES—MONEY TO LOAN St. Philip's Building Association of the In stitute will issue a third series of stock FRIDA EVENING, April 16th, at St. Philip's Hall, Sixt and Queen streets.

2t*90 JOHN CARNEY, Pres't.

☞ SPECIAL NOTICE.—THE CENTE nial Loan Exhibition will open THIS DA (Thursday), 15th, at 6 P. M. After that date w be open daily, from 10 A. M. to 10 P. M., unt further notice. §

☞ NATIONAL FINANCIAL REFOR League.—Regular stated meeting on FR DAY EVENING, 16th instant, at 8 o'clock, at ha S. W. corner Tenth and Filbert streets. Report Delegate to Cleveland Convention will be receiv and other business of importance transacted. Em nent speakers will address the meeting.

Citizens are invited.

2t*793 THOS. ROWLETT

☞ HEADQUARTERS, NO. 1014 WALN street.

The Democratic City Executive Committee w meet on FRIDAY EVENING, April 16th, at ei o'clock. Business of importance.

BENJAMIN L. TEMPLE,

*981 Chairman

☞ RESOLUTION OF THANKS.—A T meeting of St. Vincent de Paul's Socie held at their meeting room, Manayunk, April 4 1875, President P. Dillon in the Chair, the us business of the Society was transacted, af which the following resolutions were unanimous adopted:

Whereas, On the evening of March 19th, 1875, a supper given by St. Vincent de Paul's Society, the above names place, for the benefit of Destitu Poor of this Town, irrespective of class, cree caste, or color, the result of which was a grand su cess, financially and otherwise, and

Whereas, It is but justice due to the people Manayunk and vicinity, who gave freely their u solicited patronage, together with hearty sympat which enabled us to a great extent to accompli our charitable object, therefore

Resolved, That we, the members of the socie do return our sincere thanks and gratitude to t people generally of Manayunk for the assista kindly rendered us in helping to palliate the s fering and distress of our people, occasioned by long and severe winter and scarcity of empl ment.

Resolved, That our especial thanks be tendered George Gross, Esq., and the lady and gentlem friends from the city, also Miss Williams, Mrs. M Kinly for amusing and entertaining the vast a dience; to Mrs. Jane McNamee and her assistan in their tedious duty in charge of tables; also to S John's Cadets Cornet Band, for their kindness te dered on that occasion.

Resolved, That the above be published in t Philadelphia Ledger.

Committee of Arrangements.

*63 JOHN DOUGHERTY, Chairman.

CO-PARTNERSHIPS.

THE PARTNERSHIP HERETOFORE EXIS ing between JOS. BECHER and WM. SHE MER, under the firm name of BECHER & SHE MER, is this day dissolved by mutual consent.

JOS. BECHER.
WM. SHERMER.

Philadelphia, April 15th, 1875.

The business of the late firm will be settled by t undersigned, and will also be continued for t manufacture of all grades of harness, collars, whi &c., at the old stand, 245 Race street.

3t*618 JOS. BECHER

WE, THE UNDERSIGNED, HAVING PU chased the interest of Mr. H. F. HOOVER the Cabinet Works No. 1734 N. Second street, w continue the business at the old stand, as above, the firm name of WEISS & FOWLER. We wou solicit the favors of our customers as heretofore.

P. P. WEISS,
April 9th, 1875. *650 W. H. FOWLER

COPARTNERSHIP NOTICE.—PHILADE phia, April 15th, 1875.—The undersigned ha this day formed a copartnership under the firm nar of THOURON & NEWBOLD, for the transactio of the Stock Brokerage business.

MARTIN THOURON,
*483 J. PEMBERTON NEWBOLD.

THE FIRM OF McCANDLESS & KILLEN Plumbers and Gas Fitters, have, this day, Apr 14th, 1875, dissolved Partnership by mutual consen All business of said firm will be settled by W. J. McCandless, 1842 Lombard street.

W. J. McCANDLESS.
*407 E. G. KILLEN.

MISCELLANEOUS.

FOR RENT—SCHOONER OF 85 TONS, 142 Chesnut street. *365

WATER PRESSURE BEER PUMP FO sale. 26 South Twelfth street. 3t*46

ROOFING.—ALL KINDS OF LEAKY ROO repaired by KNOWLAN, 1705 Market st. 3t

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FOR SALE, CHEAP—A NEW SPRING GR cer's Barrow. Call at 1023 Melon street. *80

DRAINS LAID AT LOWEST PRICE. O structions removed. G. HIRST, 1324 Coa street. tuthsllt

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TERRA COTTA DRAIN PIPE, BRANCH &c. Gloucester Works, 6 N. 7th st. 4t

---

SCALES, TEA CADDIES, COFFEE BINS A Mills, Grocers' Fixtures in general. Tin Wa FRIES & CO., Manufa's, 909 Filbert. 9t-tuths

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MANTELS, MANTELS.

On hand, a large assortment of Marble M tels, of rich and elegant designs, made of white colored marbles, at A. STEINMETZ'S Steam M ble Works, 1029 Ridge avenue. 2

DEMIJOHNS, PORTER AND MINER Water Bottles, Wine Bottles and Flasks for at Dyottville Glassworks and 27 South Front str 19t§ HENRY B. BENNER

THE PHILADELPHIA EMPORIUM F Paints and Varnishes. A full line of the b goods at the lowest possible prices.

FELTON, RAU & SIBLEY,
stuth4t* 136, 138 and 140 N. Fourth s

CXV.—OUR ROUND-CORNER SHO Cases are the cheapest, most desirab W. H. GROVE, 115 North Fourth street. c

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CXXXII.—THE "CONVEX" SHO Case is superior to all othe Factory, 132 and 134 N. 4th st. 5t*651 JAS. IRO

FOR SALE—THE SLOOP-RIGG Yacht Mary. Apply to HENRY ROBER Bridesburg Hotel, Bridesburg. 3t*7

TWO FINE NEWFOUNDLAND P pies, male and female, 10 varieties pure b Fowls, White Squirrels, Fancy Pigeons and Sing Canaries to be found at LONG'S, 39 North N street. *2

FOR SALE—A NEWFOUNDLAND Shepherd Dog, 3 years old. 212 Ella st.

FOR SALE—A LARGE BLACK NE foundland Dog, 1031 Walnut st. *7

FULL-BRED SETTER PUPS F sale. 751 Passyunk avenue. 2t*

FOR SALE—A FINE LOT OF COCK Spaniel Pups; also Spitzer Pups. Apply South Fourth street. *9

WANTED—A FEW THOROUGHBR Alderney Cows. State price, age, pedig and address P. P. P., Ledger Office.

NEW AND SECOND-HAND FIRE A Burglar-proof Safes cheap, by C. HASSE FORDER, 231 Vine st., below Third. 3t*45

IF YOU WOULD BE PROPERL suited with Spectacles, apply to Dr. C. GRAY, Optician, 28 N. Twelfth street. 3t*

ELASTIC TRUSS, WORN DAY AN night, cures Rupture. Office, 1202 Chesn street. No more suffering from metal trusses. *8

WHY WEAR A TRUSS FOR LIF when you can be cured by wearing one R. LEIGH'S Electro-Galvanic Trusses? Can re to the parties cured. Elastic Belts, Stockings, S porters, hard rubber and all kinds of cheap Trus 12 N. Ninth st., ab. Market. Lady attendant. 4t

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PHILA. SURGEONS' BANDAGE stitute. Remember, 14 North Ninth above Market. Forty years' experience. B. C. E RETT'S Truss has cured rupture of 58 years. E tic Stockings, Belts, Braces, Supporters, Crutch Cheapest and oldest Store. Lady attendant. 1

Gazette of April 15, '75

Professor Joseph W. Wilson then asked Mr. Brown to return to a test previously tried, of locating an imaginary pain, and said that his proposed test was intended to throw light upon the theory that Mr. Brown performed his tests through a keen sense of involuntary muscular movements on the part of the subject.

Mr. Brown agreed to try the test, but before bandaging his eyes, he told Professor Wilson that he must not locate the imaginary pain in the left arm or hand—the hand which Mr. Brown held during the "mind reading."

Professor Wilson then explained that he would have to abandon his test, as he proposed to locate the imaginary pain in the centre of his left hand, to which, he thought, it was not possible he could impart any involuntary muscular movement that could direct Mr. Brown.

The last test was then begun, which was that of receiving mental impressions from one person through the passive agency of another. Mr. A. E. Outerbridge, a member of the Bar, and Mr. Abbott were selected by the committee for this test, and of these Mr. Brown selected Mr. Outerbridge to act as the passive agent. Mr. Brown took the right hand of Mr. Outerbridge, who was required to close his eyes, and Mr. Abbott, with his left hand grasped Mr. Outerbridge's wrist. Mr. Abbott was then requested to think of some person in the audience and Mr. Brown, through Mr. Outerbridge, undertook to find the person so thought of by Mr. Abbott. The test failed, and, Mr. Brown asking for another subject in place of Mr. Outerbridge, Mr. H. P. Muirheid took Mr. Abbott's place and Mr. Abbott acted as the passive agent. This test partially failed, although Mr. Brown selected as the person thought of a reporter seated next to Mr. Muirheid's brother, whom the latter had in his mind. The mistake was not noticed, and the test having been so near successful was so pronounced by Prof. Neill, and the evening's entertainment was closed.

Some tests for future experiments having been proposed by Dr. Neill, and accepted by Mr. Brown, the latter asked for the judgment of the committee as to the experiments of that evening. After brief consultation Mr. McKean was authorized to say for the committee that no member of it had any idea that he would be upon it until called upon to serve, and that, therefore, there could be no possibility of collusion between Mr. Brown and them; that they must, in fairness say that the tests had been successful in showing that Mr. Brown was possessed of an extraordinary gift, which they could not attempt to explain, or account for or theorize about at present; and that the audience were fully as capable of doing that as the committee.

fully invited to attend the funeral, on
afternoon, at 2 o'clock, from the residence of h
parents, 4007 Ludlow st., West Phila. *527

MILLER.—On the 13th inst., ALBERT, son o
John and Fanny Miller, 4 years of age.

Gone to meet his brother. *238

MINTZER.—On the 11th inst., Mrs. D. MINT
ZER, widow of the late Rev. Geo. Mintzer.

The funeral services will be held at her late res
dence, No. 1612 Brandywine street, Philadelphi
this day, April 15th, at 9 o'clock A. M. Relativ
and friends are cordially invited to attend. Inte
ment at Montgomery Cemetery, Norristown, at
o'clock P. M., same day. 448*

MOLONEY.—On the 13th instant, CATHARIN
wife of Thomas Moloney.

The relatives and friends of the family are r
spectfully invited to attend the funeral, from b
husband's residence, No. 128 Church street, Man
yunk, on Friday afternoon, at 1 o'clock. Service
Saint John's Church, Manayunk. Interment at C
thedral Cemetery. **183

MULLEN.—On the 13th inst., BRIDGET, wife
James Mullen, aged 62 years.

The relatives and friends of the family are r
spectfully invited to attend the funeral, on Frid
morning, at 8½ o'clock, from the residence of h
husband, 1348 North Second street. Solemn Hig
Mass at St. Michael's. To proceed to Cathedral C
metery **934

PACKER.—On the 11th inst., EDITH M., wife
the late Edward S. Packer, of Woodbury, and eld
daughter of the late Isaac Foulk.

The relatives and friends of the family are r
spectfully invited to attend the funeral, t
(Thursday) afternoon, at 3 o'clock, from her late
sidence, 511 Wilder st. Interment Sixth st. Un
Ground. *3

PAUL.—On the 14th instant, JOSEPH H., son
David S. and Rebecca S. Paul, in the 39th yea
his age.

"In Jesus have I put my trust."

The relatives and friends of the family, Southw
Lodge, No. 146, I. O. O. F., Southwark Lodge, N
18, K. of P., Weccacoe Fire Co., Firemen's Re
Association, and the M. O. C. of Philadelphia, a
Wildey Lodge, I. O. O. F., and Damon Lodge, K
P., of Camden, are invited to attend the funeral,
Sunday next, at 1 P. M., from his parents' re
dence, No. 512 Penn street, Camden, N. J. Inte
ment at Evergreen Cemetery, Camden. ***87

PETERSON.—On the 13th instant, CHARLES
PETERSON, in the 35th year of his age.

The relatives and friends of the family are r
spectfully invited to attend the funeral, from
late residence, rear of 1316 Corn street, on Frid
afternoon, at 3 o'clock. To proceed to Wharf
Street M. E. Church Vault for interment. *

POWELL.—On the 12th inst., LETITIA, wife
the late Henry Powell, aged 69 years.

The relatives and friends of the family are
spectfully invited to attend the funeral, t
morning, at 8½ o'clock, from her late reside
206 Thompson street. High Mass and interment
St. Michael's.

ROBINSON.—Suddenly, on the 12th inst., M
SARAH A., widow of the late Israel Robinson
the 63th year of her age.

The relatives and friends of the family are
spectfully invited to attend the funeral, from
late residence, 1229 Stiles street, on Friday, the 1
inst., at 11 o'clock A. M. To proceed to Ronaldso
Cemetery. *

ROBINSON.—On the 14th inst., CHARLES
only son of Charles L. and Emma L. Robinson, a
5 years and 10 months.

The house is sad and lonely now,
Since one we loved so well is gone;
A place is vacant at our home
Which never can be filled.

The relatives and friends of the family are
vited to attend the funeral, from the residence of
grandfather, No. 1319 S. Front street, this day, 1

so alarming that it was not persisted in. According to her own account, the patient had to be watched night and day by dressers.

Feb. 2. Mr. Tait passed a double elastic ligature through the base of the tumour by means of a trocar, and tied it in opposite directions, so that each half of the ligature embraced half of the base of the tumour. A quarter of a grain of morphia was at the same time injected under the skin of the arm.

4th. The tumour quite black, and nearly separated.

7th. The separation is complete, and a healthy granulating surface about three inches in diameter is left, to which red lotion was applied as a dressing.

Very little pain was complained of after the first twenty-four hours, and there was never the least hemorrhage. On the 23d of the month the wound was almost healed.

H. S., aged thirty-three, admitted Jan. 5th with a deep and very sinuous fistula leading from about two inches to the left of the anus through the ischio-rectal fossa to an aperture in the rectum about three inches up. An elastic ligature was passed and tied on the 26th, and it came out on the 30th. Considerable pain was felt for a few hours after its insertion. The track healed perfectly, and the patient was discharged cured. In this case the advantage of the ligature over the knife was that it saved all loss of blood, and, as the patient was very anæmic, that was a point of importance.

M. P., admitted April 27th, suffering from three perineal fistulæ, one opening to the right of the right labium, and the others about an inch and two inches respectively to the right of the anus. The uterus was quite fixed, and the history given indicated the occurrence of a pelvic hæmatocele some months previously, and its subsequent suppuration. These fistulous tracks led up into a cavity behind the uterus, from which a very abundant discharge flowed after its exploration.

May 1. Two elastic ligatures were passed, one through the track opening in the labium, and the other through the principal track to the right of the anus into the suppurating cavity, and thence through an opening made into the rectum, and then they were tied through the rectum. They made their way out on May 4th and 5th. A few days later the discharge was coming entirely through the rectum.

19th. The discharge has very much diminished in quantity, and the patient is now able to sit comfortably, as she has not done for many months.—*Lancet*, June 27, 1874.

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The Automatic Man.—Under this appellation an account is given in the *Gazette Hebdomadaire* of July 17, of a curious case which has come under the observation of Dr. Mesnet, of the St. Antoine Hospital. A young man during the late war had a portion of the left parietal, about eight centimetres in extent, carried away by a ball. Hemiplegia of the right side was the consequence, but this gradually disappeared. For some time past he has been the subject of attacks, lasting from twenty-four to forty-eight hours, attended by very extraordinary phenomena. During these he seems to act exactly like an automaton, walking continuously, incessantly moving his jaw (*machonnant*), knitting his brow, and appearing absolutely insensible to all that surrounds him. Not uttering a word, he walks straight forward, and when he meets with an obstacle, stops short, explores it with his hand, and tries to pass on one side of it. Surrounded by a circle of persons, he stops at each, and endeavours to pass by the intervals formed by their joined hands, then turns back, comes in contact with the next person, and resumes his round. All this time he never manifests the slightest consciousness, just as if he were in a state of somnambulism. He is absolutely insensible to pain, so that pins may be thrust through the cheek or into the fingers, or very powerful electrical shocks may be administered without the slightest sensibility being manifested. What, however, is very remarkable, is that by bringing him in relation with certain objects we are enabled to determine in him the entire series of acts which are correlative with the sensation thus aroused. Thus,

if a pen be placed in his hand, he seeks for ink and paper, and writes a letter in a very good hand, in which he speaks very sensibly about different matters which concern him. If a leaf of cigarette paper is placed in his hand, he feels in his pocket for the tobacco, rolls up the cigarette very adroitly, and, having found his match-box, lights it. If the match be extinguished just as it reaches the cigarette, he finds another, and that several times, until he is allowed to light his cigarette. If at the moment when the match is extinguished, another already lighted is presented to him in its place, it is impossible to induce him to light the cigarette by means of the substituted match. He allows his moustaches to become burned without offering any resistance, but he will not employ the light thus presented to him. If chopped charpie be placed in his pocket instead of his tobacco, he makes the cigarette with this, and lights and smokes it without seeming to pay any attention to what he is smoking.

Among the various experiments devised by Dr. Mesnet, there is one which is particularly curious. The young man is a singer at concerts by profession, and if gloves be placed in his hands he immediately puts them on, and searches for paper. When a roll of this, resembling music in form, is given to him, he places himself in the proper position and begins to sing. It would seem, in fact, that tactile sensation induced in him becomes the point of departure, and as if of escape, of a series of acts correlative to this initial sensation —acts which he accomplishes automatically, without letting them deviate from their habitual and regular succession. Lastly, it is to be noted that, while in this singular condition, the patient steals all that comes within his grasp. If he touches any person, he feels for his watch-pocket, and invariably detaches the watch and puts it in his own pocket, whence it may be immediately removed without his making the slightest opposition. The crisis once over he has no recollection whatever of what he has been doing, and becomes again perfectly reasonable.

The questions that such a case gives rise to for the reflection of the physician and psychologist are striking. How, indeed, is such a fact to be characterized? and what idea is to be formed concerning the modifications of the functions of the nervous system which it exhibits? A no less interest must be felt by the medical legist, for evidently during these crises such an individual must be absolutely irresponsible. But how, under similar circumstances, are the facts to be ascertained? What precedes is a mere sketch of some of the features of this curious case. Dr. Mesnet, armed with all the resources derived from a consummate experience in the study of mental diseases, has had it for some time under investigation, and will immediately publish a memoir upon the subject.—*Med. Times and Gaz.*, July 25, 1874.

MEDICAL NEWS.

DOMESTIC INTELLIGENCE.

Ulceration of Vermiform Appendix; Abscess.—Prof. H. B. Sands exhibited at a recent meeting of the New York Pathological Society (*New York Med. Journ.*, Aug. 1874) four small fecal concretions, which were interesting from the fact that they were discharged from an abscess resulting from peritonitis, consequent on ulceration of the vermiform appendix.

They were from a gentleman aged forty-one years. Having left his residence in the morning of April 23d, in his usual health, in the afternoon he suffered great pain, diffused over the abdomen; nausea and vomiting. He felt cold, but had not a distinct chill. The vomiting and nausea subsided after a few hours, but the pain in the abdomen continued, being most severe in the right iliac region. He was seen with Dr. Ball on the following evening, at which time he presented symptoms of localized peritonitis, also in the right iliac region. No decided change had taken place by April 26th, three days after attack. The abdomen was slightly swollen throughout, but not very tense. The tumour could be felt in the neighbourhood of the cæcum, about as large as the fist, and quite firm to the touch. The question arose as to the true nature of the disease. It might be either—1.

(Gray says the nerve of Wrisberg comes from extent column of spinal cord; but very probably only part arises; it is the gustatory portion of the brain)

"communicates" in its course of (Gray) with the lingual branch, other branches, but nerve) I do not see why this might not explain its function in regard to taste

(Chord a tympani possibly from experiments make appear the nerve of Wrisberg "interdiction of molecules" which may be the nerve of taste)

; unless to its own filaments be ascribed an influence upon secretion, through small branches going to the parotid and submaxillary glands. The flow of tears sometimes following its division or paralysis appears to result from the loss of tension of Horner's muscle (tensor tarsi) and the consequent obstruction of the puncta lacrymalia. Taste is impaired in some cases of paralysis of the facial nerve, the precise reason for which loss is not certainly explained, although it has been referred to inaction of the muscles of the tongue.

The fifth & seventh nerves are, in function, closely mutually related.

Pflüger & others assert cardio-inhibition

Moleschott & others deny it.

Von Bezold, 3 sorts of nerves about the heart. 1. Its own ganglia & nerves, 2. Pneumo-gastric, inhibitory. 3. Sympathetic, excitant.

~~the pharyngeal branch and~~

~~mostly, if not altogether~~ (the latter is denied positively by some physiologists)

Prof. Mason, on basis of experiments of his on dogs & pigeons, finds "inhibition" of heart ~~through~~ through right pneumogastric.

(Lancet, Dec. 7. 1872.) (See back)

That the method of experimentation may be better understood, I give a short résumé of cardiac physiology as taught at present.

The heart contains ganglia which send motor fibres to the cardiac muscle. In addition to motor ganglia there are other ganglia, called regulating ganglia, which co-ordinate the action of the heart, and act on the muscular fibres of the heart through the motor ganglia. The regulating ganglia oppose a certain resistance to the transmission of motor impulses to the cardiac muscle,—that is, governing the rhythm, and preventing the motor ganglia from exhausting themselves by irregular and excited action. Although the heart contains its own power of action, yet there are afferent and efferent nerves which play an important part in its movements: the pneumogastrics when irritated slow the pulse and augment its force, whilst the accelerators increase their number, but diminish their power. The pneumogastrics are especially excited by carbolic acid, decrement of temperature, and the sad emotions, whilst the accelerators are particularly thrown into action by the exhilarating emotions, increment of temperature, and oxygen. The brain also takes part in the regulation of the circulation through the vaso-motor centre situated in the medulla. This centre regulates the calibre of the small arteries, diminishing or increasing the amount of blood flowing through them. The cardiac ~~afferent~~ nerves just described can be thrown into increased action by sensations through the terminations of the sensory nerves in any section of the body: hence the irritation of any portion of our skin can modify the amount of blood which flows through our body in a certain time, thus altering by necessity the functions of other organs. This fact explains the action of many external remedial agents, as baths, sinapisms, actual cautery, etc. The

By Dr. J. Ott, Demonstrator of Physiology, Univ. of Penna.

ties; sensibility very small. 2.10 P.M., .02 gramme subcutaneously. 2.45 P.M., frog dead. Peripheral end of sciatic irritable at twenty-nine centimetres; muscles directly irritable at seventeen centimetres; spinal cord non-excitable; heart beating twenty times per minute.

The above experiments show that gelsemia produces loss of sensibility, want of co-ordination and paralysis of motor power, and finally death. The loss of sensation always precedes that of motion.

Exp. III.—Frog with right iliac artery and vein tied, received at 8.35 A.M. .04 gramme of gelsemia; hops away. 8.50 A.M., sensibility much diminished; 8.54 A.M., .02 gramme subcutaneously. 9.35 A.M., .02 gramme; sensibility greatly reduced; lower jaw hanging down; lies with extremities stretched out; loss of co-ordination. 10.5 A.M., suddenly struggles with posterior extremities. 10.22 A.M., sensibility nearly lost; can move when pinched. 10.23 A.M., dead. Peripheral end of sciatic on poisoned side is excitable at thirty-seven centimetres; on normal side at forty-three centimetres; no reflex action by irritating central end of sciatic; thrusting probe down the spine gives a few feeble twitches; the gastrocnemius on sound side by direct irritation responds at twenty-eight centimetres; the gastrocnemius of poisoned side is excitable at same distance of secondary coil from the primary.

This experiment shows that the poison attacks the sensory ganglia first, and then gradually paralyzes the motor ganglia; that it has no action on the muscular system.

Exp. IV.—Rabbit; at 4.25 P.M. received .01 gramme gelsemia per jugular. 4.27 P.M. to 4.31 P.M., .04 gramme gelsemia. After each injection there were convulsive movements. 4.33 P.M., the rabbit seems unable to move; feet slide from under him; muscles of neck seem especially weak, as head falls down on floor; rolls over on side occasionally. 4.40 P.M., convulsive movements of the fore extremities and muscles of lower jaw; the jaws snap together; violent expiratory movement, accompanied with a crying noise; pupil dilated. 4.41 P.M., animal dead; cord gives a few very feeble twitches on probe-thrust; motor nerves excitable; heart beating.

afferent nerve-fibres of the heart are the depressors of Ludwig and Cyon; they are the mechanism by which rupture of the heart by great arterial tension is avoided; as an excited action of the vaso-motor centre might cause. They convey the impulse from the heart to the vaso-motor centre which is paralyzed, and thus the small arteries are relaxed and the heart empties itself, the tension decreases, and everything works freely; they are the safety-valves of the heart, similar in function to those found on steam-engines. These nerves also convey to the brain the sensations of a light, heavy, or palpitating heart.

PHILADELPHIA

SATURDAY, JULY 31, 1875.

ORIGINAL COMMUNICATIONS.

PHYSIOLOGICAL ACTION OF GELSEMIA.

BY J. OTT, M.D.,

Demonstrator of Physiology, University of Pennsylvania.

GELSEMIA was first procured in a pure state by Prof. Wormley, Mr. Henry Kollock, C. L.

INNERVATION OF THE HEART AND BLOOD-VESSELS.—Prof. Wm. Rutherford, in his admirable lecture on Experimental Physiology in the *Lancet* for December 16, 1871, and January 20, 1872, shows that within the heart there is a reflex nerve mechanism, consisting of cells connected with intra-cardiac and extra-cardiac nerves; the former being cardio-motor and excito-cardio-motor, the latter cardio-inhibitory. The extra-cardiac nerves are branches of the vagus and sympathetic, and both are connected with the medulla oblongata. Both nerves transmit their influence to the heart, the sympathetic accelerating the cardiac action, the vagus inhibiting or retarding it, and, if powerfully stimulated, even for a time completely arresting the cardiac contractions, the heart during the rest being dilated. The branch of the vagus which does this is, in rabbits, the inferior cardiac.

The superior cardiac branch of the vagus is the sensory nerve of the heart, and is also an inhibitory nerve, but inhibitory for the blood-vessels; that is, when it acts it brings the contractile elements in the blood-vessels into a state of rest, thereby causing dilatation. Thus, while the inferior cardiac branch of the vagus is cardio-inhibitory, the superior cardiac is vaso-inhibitory. The former transmits its influence from the medulla oblongata to the cardiac ganglia; the latter transmits its influence from some portion of the heart to the medulla.

The vaso-motor nerves are immediately derived from the sympathetic; but Ludwig and Thery have shown that the nerve-cells presiding over them are not contained in the sympathetic ganglia, but in the medulla oblongata, which is therefore the seat of the general vaso-motor centre: general, for possibly there are special vaso-motor centres in the submaxillary ganglion and in the ganglia found in the penis. The vaso-motor nerves *leave the spinal cord in the anterior roots of the spinal nerves*, whence they either pass through, or receive branches from, the ganglia upon the sympathetic, and proceed to the blood-vessels. The general vaso-motor centre in the medulla oblongata appears to be in almost constant action, thereby keeping up some degree of contraction in the blood-vessels. But its action may also be diminished, the effect of which is diminished contraction or complete relaxation of the vessel. The vaso-motor nerve being for the time paralyzed, the walls of the vessel relax, and the blood-pressure and elasticity open up the vessels. The nerves which do this Dr. Rutherford calls vaso-inhibitory nerves, corresponding to the cardio-inhibitory. The most remarkable vaso-inhibitory nerve we know is that already alluded to as such,—the superior cardiac branch of the vagus in the rabbit. If we divide this nerve and stimulate its central end, we cause a remarkable lowering of the blood-pressure, owing chiefly to dilatation of vessels in the abdominal viscera and lungs (Ludwig and Cyon). The inhibiting influence seems to be conveyed to the medulla. There are two instances in which vascular dilatation follows stimulation of the peripheral end of a nerve,—viz., the chorda tympani, and the nervi erigentes of the penis.

The application of these facts is made to nutrition in accounting for the vascular dilatation in active nutritive changes, which are accounted for by Prof. Rutherford by the action of these vaso-inhibitory nerves, instead of to a more powerful *vis a fronte*. Loven approximates the same idea when he shows that the blood-vessels of a part may be dilated by artificial stimulation of its different nerves, as in inflammation or irritation; but he restricted it to such phenomena as those of blisters, and did not extend it to nutrition.

Gorgeous unfeeness

The delegates were welcomed by Dr. Samuel Pollock, of Lycoming, in an eloquent address. The sittings of the society occupied portions of three days, and were relieved by a banquet, receptions, an excursion to Minnequa Springs, etc.

The address of the President, S. D. Gross, M.D., LL.D., of Philadelphia, was very interesting. It was delivered in the evening at the Academy of Music. The audience embraced many of the refined and cultivated citizens of Williamsport. The subject of the address was *physicians, their qualifications, failings, etc.*, and was well illustrated by anecdotes.

A statement, by Dr. A. H. Halberstaat, of his difficulty with the Schuylkill County Medical Society was received by the State Society and included in the transactions.

Dr. Laurence Turnbull read a report of *six hundred cases of disease of the ear.*

Dr. Benjamin Lee, of Philadelphia, read the history of a case of *thyroid dislocation of the hip-joint in the second stage of coxalgia.* It was reduced by manipulation.

The same gentleman exhibited a peculiar modification of Taylor's "spinal splint" for the relief of posterior curvature of the spine. The principle on which this instrument is constructed is to discard the crutch-head supports in the axillas, and to substitute for it pressure by means of padded plates, at and a little below the point of disease, thus preventing the opposition of the diseased surfaces.

Dr. T. H. Squire, of Elmira, exhibited his vertebrated prostatic catheter.

The reports of the county medical societies form a series of valuable papers, embracing notes on drainage, topography, geology, meteorology, mortuary tables, and prevalent diseases throughout the entire State for the past twelvemonth. From these we learn that epidemics of scarlatina ranged through large portions of the State.

The report from Philadelphia embraces an account of the epidemic of relapsing fever which occurred in that city, and also a complete record of the cases of yellow fever, imported and consequent, with maps and a succinct history of each case.

The death-rate of Philadelphia for the year 1870 was 2.27 per cent., which places it among the healthiest of cities. The total number of deaths was 15,317; of these 2308 were from phthisis pulmonalis. The death-rate for the year 1869 was 2.23 per cent. The death-rate for London for 1870 was 2.40 per cent., Edinburgh 2.60 per cent., New York 2.93 per cent., Liverpool 3.10 per cent.

BOOKS AND PAMPHLETS RECEIVED.

On the Physiology of Syphilitic Infection. By Fessenden N. Otis, M.D., Clinical Professor of Venereal Diseases at the College of Physicians and Surgeons, New York, etc. Reprinted from *The Medical Gazette.*

Clinical Observations on the Dementia and the Hemiplegia of Syphilis. By M. H. Henry, M.D., Surgeon to the New York Dispensary, Department of Venereal and Skin Diseases. Reprinted from *The American Journal of Syphilography and Dermatology.*

Third Annual Report of the State Board of Health of Massachusetts, Boston, 1872.

Practical Suggestions in Naval Hygiene. By Albert Leary Gihon, A.M., M.D., Surgeon United States Navy, etc. 12mo. pp. 131. Washington, Government Printing-Office.

According to the "current view" of the relation of the heart to the nerves, it is stimulated to action by branches from the sympathetic system. It is retarded (inhibited) by one branch of the pneumogastric nerve. Its action is facilitated by dilatation of the blood-vessels (lessening resistance), this being called vaso-inhibition; and being reflexly produced, by impressions carried by a branch of the pneumogastric to the vaso-motor centre in the Medulla oblongata: which centre is said to be (more or less) paralysed under such impressions, so that the vessels are made or allowed to dilate. When this vaso-motor centre is stimulated, it causes the vessels to contract.

One set of nerves (sympathetic) to excite the heart's action
Another set to excite the vessels (going, through sympathetic ganglia) from Medulla oblongata
One nerve (branch of pneumogastric) to retard heart's action
Another (also " ") to dilate blood-vessels

according to this, —

If the heart wants ease in its action, it telegraphs through one branch (superior cardiac in rabbit) of the vagus to the medulla oblongata, to relax the vessels. If the medulla oblongata ~~at another time~~ finds that the heart is pushing the vessels too hard, it sends word through the other branch (inferior cardiac in rabbit) down to the heart, to hold on.

If the heart moves lazily, the medulla ob. telegraphs through the sympathetic fibres for it to wake up. If the vessels are too much relaxed, they are toned up under an influence sent out from the same vaso-motor centre in the medulla oblongata. A busy centre!

DIRECT ELECTRICAL IRRITATION OF THE HEART IN MAMMALS (Sellager: *Centralblatt für die Med. Wissen.*, 1875, No. 38; from *Wien. Akad. Sitz. Ber.*, 1874).—These investigations were made upon cats and dogs, and it was found that the first action of an induced current upon the exposed hearts of these animals was to cause a diminution of the blood-pressure, and that if the current was kept up for two or three minutes the heart ceased to contract at all, —that it was in fact dead. Immediately after the application of the irritant the rhythmical movements of the organ ceased, and there was only a tremulous motion of the muscular structures. The same phenomena occurred when the nervous apparatus of the heart was paralyzed by atropia or curara. The action of the constant current was the same as that of the induced: so that it must be concluded that electricity when applied directly to the organ is a true "cardiac poison," and that electrical irritation of the heart must be advised against as a very dangerous procedure.

W. A.

Same as pen "vagum"

Crushing Med. obl, Same effect,

PRESSURE [illegible] JOINT DURING [illegible]

(Dr. H. R. Ranke: *Centralblatt für Chir.*, No. 39, 1875).—A question of the manner in which permanent extension of the limb affects the intra-articular pressure has quite recently been raised, but no satisfactory answer to it has hitherto been given. The investigations of the subject which have been made have been carried out on the dead body; but some cases in which puncture of joints was performed have given Ranke the opportunity of studying the conditions which exist in the living. The trocar with which the joints were opened had a lateral orifice which was in connection with an open mercurial manometer, and the outer orifice of the canula could be kept open or shut, at pleasure, after the withdrawal of the stylet, so that the contents of the joint could flow out, or fluids could be injected into it. Extension of the limb was made by several methods, and counter-extension was obtained either by the weight of the body or by the use of a perineal band; but no difference in the action of the several appliances was observed. The measurements gave the fol-

branches. Of these, the *ophthalmic* (supra-orbital, etc., see *Anatomy*) and *superior maxillary* are entirely sensory; to them being due the sensibility of the upper parts of the face. The inferior maxillary receives all the filaments of the anterior *motor* root of the 5th, besides sensory filaments like the other branches. It supplies the *muscles* of *mastication;* including the buccinator. One branch of the inferior maxillary (lingual nerve) is one of the two nerves of *taste;* going to the tip of the tongue.

The 5th nerve is, perhaps, the most acutely sensitive in the body. Injuries of it produce an indirect disturbance of nutrition; the exact rationale of which has not been entirely explained. *Reflex* symptoms sometimes follow irritation of its branches; as, when a severe blow over the supra-orbital notch causes sympathetic blindness (Morgagni); or a mis-fitting artificial tooth brings on convulsions (Lederer). *Tic douloureux,* or neuralgia of the face, is an affection of the 5th pair.

8th pair.—Three really separate nerves are included under this; the *par vagum* or *pneumogastric,* the *glosso-pharyngeal,* and the *spinal accessory.*

Pneumogastric nerve.—Although mostly sensory, or at least *afferent,* some motor influence seems to belong to this nerve. Probably the latter is derived from filaments contributed by the spinal accessory; as such enter into the *inferior laryngeal* branch of the par vagum, which supplies the vocal muscles. The *superior* laryngeal is a sensitive nerve.

The pneumogastric is the main afferent nerve of respiration; by which the impression of the need of fresh air (*besoin de respirer* of the French) is transmitted from the lungs to the medulla oblongata. Probably, however, other nerves may contribute to the same end, by conveying to the same respiratory centre an impression of the need of air from all parts of the body.

Digestion is also to some extent under the influence of the same nerve. When one pneumogastric is divided in a living animal, near the stomach, its digestion is interrupted. After some days, however, it may recover from the injury, and digest as before. If, then, that of the other side be also cut, digestion is more seriously interfered with, and for a longer time; but, at length, before either of the nerves has reunited, the functional action of the stomach is restored. These facts show, that, while the pneumogastric nerve has an *influence* over the digestive process, it is not *essential* to it.

How the *heart* is affected by the normal functional action of the pneumogastric is a difficult question. Vivisection has introduced a problem concerning it. When, in a living animal, the chest is opened, and the pneumogastric divided, if a *powerful* galvanic current be made to act on the end of the nerve towards the heart, that organ ceases to beat almost at once. Two theories have been proposed to explain this. One, that of *inhibition;* namely, that it

is the function of the pneumogastric to *check* or *retard* the heart's action. The other, that, since it is only a very strong current of galvanic electricity that will arrest the heart's action, this result is produced by *exhausting* or overwhelming the heart by excessive irritation. The latter is probably true.

Glosso-pharyngeal nerve.—As indicated by its name, this is distributed to the tongue and pharynx. It is doubtful whether a motor function belongs to any of its fibres. It is the afferent nerve of deglutition, and the general sensory nerve of the pharynx. One branch of it is a nerve of *taste;* being distributed to the base and middle of the tongue, and to the soft palate.

Spinal accessory nerve.—The two branches of this, *external* and *internal*, are of separate origins. The *internal* branch comes from the medulla oblongata, and is distributed to the vocal muscles of the larynx; being their motor nerve. The *external* branch comes from the spinal cord, enters the cranium by the foramen magnum—and, going out with the internal branch, is distributed to the *sterno-cleido-mastoid* and *trapezius* muscles. It has only motor functions.

Cerebral Hemispheres.

A marked peculiarity of the brain, besides the proportionately large supply of blood which it receives, is, the *variation* in the flow of blood through it from time to time, according to the presence or absence of mental excitement. As, however, a certain degree of increase of *pressure* will arrest the functions of the encephalon, even fatally (as in compression of the brain from fracture of the skull), provision must be made to avoid that pressure. This is done, partly, by the adapted increase of rapidity in the escape of blood from the brain by the veins; but more effectually by the movements of the *cerebro-spinal fluid.* This is a serous liquid, contained beneath the arachnoid membrane of the brain and spinal marrow, and passing readily from the one to the other. If more blood enters the brain, a larger amount of sub-arachnoid fluid leaves it to go into the spinal cavity; and *vice versâ.*

Upon the large and difficult subject of the functions of the cerebral hemispheres, much might be written (see *Carpenter's Human Physiology*). For economy of space it is proper to attempt here a statement only of all the most positive, and some of the most probable conclusions as yet attainable in regard to it.

1. The *cerebral hemispheres* are the sole organs of *mind;* that is, of intellect and emotion, as well as of will. The *active* portions of the hemispheres are, on good ground, believed to be the superficial or peripheral *convolutions;* the white substance being commissural or communicative only.

2. The two hemispheres, under all ordinary conditions at least,

the men, and make a report thereon in writing to the commanding officer, with such recommendations as he may deem proper. If the recommendations be approved and carried out, the medical officer shall note the fact in the medical history of the post. If the action recommended be deemed impracticable or undesirable, the commanding officer shall indorse his objections on the report and forward it to the Department Commander. A copy of such endorsement shall be

ABSENCE OF THE CORPUS CALLOSUM.—Dr. Malinverni, Professor of Pathological Anatomy in the University of Turin, reports in the *Gazetta delle Clinichi* a case in which there was no corpus callosum. The patient, who died of typhoid fever, was well known to have had well-developed intellectual faculties. The septum lucidum and the convolution of the corpus callosum were absent, and the lateral ventricles communicated freely with each other.

1875

MIND—WHAT IS IT? (2)

Hear the answer of an evolutionist—the latest, Mr. John Fiske, late Lecturer on Philosophy in Harvard College :

"Mind, as known to the possessor of it, is a circumscribed aggregate of activities ; and the cohesion of these activities, one with another, throughout the aggregate, compels the postulation of a something of which they are the activities. But the same experiences which make him aware of this coherent aggregate of mental activities, simultaneously make him aware of activities that are not included in it—outlying activities which become known by their efforts on this aggregate, but which are experimentally proved to be not coherent without, and to be coherent with one another."

This is clear as mud, and indicates about the sort of mind which we should expect to see evolved from protoplasm by natural, material forces, up through all the grades of insect, fish, fowl, and monkey life, till it finally found lodgment in a human form.

ed or squandered at pleasure. He is apprenticed simply to be taught his trade, and to observe orders in working hours. For the rest, unless in the rather exceptional case of his having a good paternal home of his own, he may at will spend his evenings at the "Varieties," or with the street gangs, and if he be only in his place in the morning no questions are asked. There is no provision for Sabbath care. He may be in the Sunday-school, and in the house of God, or at the beer garden, or Smith's Island : all is at his own will. In cases only too numerous, the only advantage of an apprenticeship to the morals of the boy, is the tendency of eight or ten hours of daily labor, to inspire the purpose of securing competence and respectability by honorable industry.

But back of all these are the thousands

^ Physology of different forms of paralysis.
Anaesthesia & acinesia — cerebral — spinal — periph. - reflex
Locomotor ataxia — Infantile paralysis — muscular sclerosis.

*

On the relation of mind to brain. ☒

1. Materialistic theory: Moleschott Büchner Spalding

"Ohne phosphor keine gedanke."
"Brain secretes thought as liver secr. bile."
"Attention is arrested transmutation of force in brain-cells." (Maudsley).
Dynamic theory of Carpenter & Porter!

2. Spiritualistic theory:
(Descartes) — Berkeley — Emerson — & Metaphysicians.

3. Pneumato-psychical theory.

Spencer — Bain — Maudsley — Huxley
Tyndall? 1874.

Faraday — Brewster, Duke of Argyle, McCosh

Darwinism applied to the evolution of emotions from types below man — & of emotional expressions: — & even of conscience! Expression

Natural gradation:
1. inorganic, mineral kingdom of nature
2. vegetative. 3 animal — sensori-motor — inst. — reflex.
4. Higher animal, emotional & intelligent
5. Human — Spiritual. [Autonom, — facts]

justly attributed to the inefficient carrying out of it, and that in some other instances the apparent high mortality is due to none but the most serious cases being included, or to the patients having been soldiers, worn out by the hardships and toils of a severe campaign.

When the evidence furnished by single observers is noted, the results are even more astonishing than that of the above table; so that although the aphorism of Brandt, as quoted and endorsed by Glénard,—"every enteric patient regularly treated from the commencement by cold water will be free from complications, and will recover,"—can scarcely be accepted, yet the great merit of the method cannot be gainsaid.

Prof. Liebermeister has employed the cold-water treatment on a larger scale than has any other individual. At the hospital at Basel, up to the year 1865, 1718 cases of typhoid fever were treated upon the expectant plan, with a mortality of 27.3 per cent. In 1865, Dr. Liebermeister introduced the use of cold bathing in a timid, inefficient manner, and reduced the mortality, in 982 patients treated, to 16.2 per cent. In 1866 he commenced the vigorous regular employment of the method, and reduced the death-rate, in 1121 patients treated, to 8.2 per cent. Prof. Liebermeister himself criticises very closely, in the recent Encyclopedia of Medicine, these statistics, and raises the mortality, by excluding trifling cases, to from 10 to 11 per cent.; but, after the anti-pyretic treatment has been even unjustly dealt with, the statistics still show that the mortality under the cold-water treatment is not half what it formerly was. Further, a certain proportion of cases are always admitted to the hospital moribund, too late for any human agency to be of avail: these cases, of course, maintain the same proportion under any treatment; they really constitute a large part of the deaths seen in the cold-water treatment, so that if they were eliminated from both sides the death-rate "under the anti-pyretic plan would be but a small fraction of what it would be under the other."

In hospital practice the patients are very rarely received upon the first day of the attack, and very frequently do not enter the wards until the third week, so that the statistics which are included in the above table, or those given by Prof. Liebermeister, favorable as they are to the new treatment, only express a portion of the truth. If the good effected be so great when the remedy is often not applied until the second or third week, much more is to be expected when it is employed faithfully from the moment the temperature becomes elevated.

Accordingly, Brandt is said to claim that if the case be properly treated, from the onset of typhoid fever, death will never occur; and it is stated (London *Lancet*, January 23, 1875) that out of 259 cases he has had 259 recoveries. I have not had access to the original papers of Dr. Brandt, and cannot, therefore, analyze his statistics; but Glénard (*loc. cit.*) is just as enthusiastic; he states, "You will not find in the five or six thousand cases of typhoid fever treated by this method one single unsuccess among those which have been submitted to it since the beginning of the disease."

It is not necessary to endorse this statement as absolutely true in order to accept the proposition that the extreme value of systematic cold bathing in typhoid and typhus fever has been so abundantly demonstrated that no excuse remains for the further neglect by physicians of this most important measure. The immediate effects of the bath upon the symptoms of the disease and upon its duration will be considered in the next article. H. C. W.

CORRESPONDENCE.

Leipsic, January 16, 1875.

To the Editor of the Philadelphia Medical Times:

Dear Sir,—Last evening, January 15, Dr. Angelo Mosso, of Turin, delivered an address before the Physiological Society here, upon "A New Method for Measuring the Alterations in the Dimensions of Blood-vessels in the Living Man;" an abstract of which I send you, as I am sure that the attention and interest of many of your readers will be excited by it.

Dr. Mosso was last year occupied in observing the alterations in the size of certain organs, such as the kidney, which take place when, after their removal from the body, an artificial circulation is brought about in them. To this end he made use of a vessel with three tubulatures. In this the organ under examination was placed, and while two of the apertures allowed the ingress and escape of the circulating fluid, in the third was inserted an upright tube which would show the expansion and contraction of the organ through the medium of oil or water, with which the vessel was filled, and which rose or fell in the perpendicular tube.

This method of marking the expansion was attended by the drawback, that an increase in the height of the column in the tube exerted a perceptible pressure upon the expanding organ; and to avoid this he constructed an apparatus which he has since been able, with remarkable success, to turn to advantage in his investigations and experiments upon the living man.

This apparatus, which Dr. Mosso has named plethysmograph, consists of two distinct portions: one, by means of which the change in volume of the extremity under examination can be transformed into a measurable motion; the other, serving to record this motion without in any way influencing the pressure upon the surface of such extremity.

The first is a tin vessel large enough to receive the fore-arm comfortably (it can, of course, be made of a proper size for leg or thigh), armed with two tubulatures and closed near the elbow by an india-rubber ring, which effectually prevents the escape of the water with which it is to be filled. One of the tubulatures is at the end, and is connected with a flexible tube which runs to the graphic portion of the apparatus, and the other, on the upper side, is used to fill the case completely with water. In it a thermometer is usually inserted through the cork which closes the case completely. The tube

shall next week offer in all humility to the consideration of the leaders of the American Medical Association a few suggestions as to the causes of that want of success in sustaining a thoroughly national society which, according to the statements of Prof. Gross, seems recently to have attended their efforts.

LEADING ARTICLES.

THE USE OF COLD IN FEVER.

NO. II.

THE clinical evidence in regard to the use of cold in fever may be looked at in two different ways. Thus, we may consider the assertions and results of individual observers, who have seen large numbers of cases of fever and used the method faithfully, or we may weigh the sum total of the experience of all who have written upon the subject. At first sight it may appear that the latter is by far the best course to pursue; but it must be borne in mind that the treatment is one opposed to the ordinary medical prejudices, that its efficient carrying out involves so much labor and attention as to be almost impossible to those who disbelieve in its usefulness, and that those physicians who claim most for the method affirm most strongly that to do much good it must be practised very vigorously and steadily.

These things being so, it seems wisest to look at the evidence from both points of view.

M. Franz Glénard affirms (*Glasgow Medical Journal*, 1874) that there have been from six thousand to eight thousand cases of typhoid fever treated by the use of cold in Austria, Prussia, and Russia, with an average mortality of from 4.5 to 7.6 per cent.; the previous mortality, under the old expectant method, having varied from 18 to 25 per cent. If these figures are correct, they are decisive. Where he gets them from, however, I do not know. All the evidence that I have met with is summarized in the following table. Unfortunately, it is not always easy to decide whether a German is writing about typhus or typhoid fever; but where it is not mentioned the probabilities are that the cases are in great part, if not wholly, enteric fever:

Table showing the Results of the Cold-Water Treatment in Typhus and Typhoid Fever.

NAME OF REPORTER.	PLACE.	NUMBER OF CASES.	MORTALITY, PER CENT.	REMARKS.
Jürgensen.	Kiel.	160	3.1	Previously 15.4 per cent. Typhoid fever.
Petri.	Laubbach.	31	3.2	
Liebermeister.	Basel.	1121	8.2	Previously 26 to 30 per cent. Treatment very rigorous. Typhoid fever.
Mosler.	Greifswald.	71	7	
Mosler.	Greifswald.	92	9	Typhus exanthematicus, previously 50 (?) per cent.
Becher.	Ostpreussen.	17	24	Typhus exanthematicus, previously, on an average, 10 per cent.
Brandt.	Stettin.	187	2.1	Private practice.
"	"	84	10	Military Hospital. Previously 30 per cent.
Goden.	"	24	20.8	
Stohr.	Würzburg.	120	6.6	Previously over 20 per cent.
Drasche.	Vienna.	40	10	Year before 16.5 per cent.
Ziemssen.	Erlangen.	32	9.4	Formerly, with bad cases, 30.2 per cent.
Stieler.	Munich.	226	5.6	Formerly 12.15 per cent.
Pastau.	Breslau.	246	11.8	Typhus exanthematicus. Without baths, mortality 16.5 per cent.
Popper.	Prague.	20	5	
Riegel.	Würzburg.	156	4.4	Only serious cases included. Almost every fatal case came in too late for baths to do good.
Götz.	Prague.	54	5.5	Typhoid fever. Other cases treated at the same time, expectantly, 15.4 per cent.
"	"	50	18.8	Typhus exanthematicus.
Scholz.	Bremen.	125	4	Typhoid fever.
Wunderlich.	Leipsic.	155	7	Typhoid fever. Previously 18.1 per cent. out of 1178 cases.
Zaubzer.	Munich.	356	5.6	Typhoid fever. Previously 17.6 per cent. out of 701 cases.
Bauer.	"	87	7	Typhoid fever. Previously 11½ to 16 per cent.
Duchek.	Vienna.	60	28.3	According to Brandt, this high mortality depended upon the treatment having been imperfectly performed.
Krofft-Ebing.	Rastatt.	105	25.7	Only bad cases. Previous mortality 34 per cent.
Wille.	Rheinau.	59	19	
Stecher.	Claye.	146	8.2	
Schönheiden.	Dammartin.	82	3.6	Mild epidemic.
Pfeifer.	Weimar.	58	5.2	
Leube.	Ulm.	47	19	Typhoid fever, among French prisoners of war. Baths of moderate temperature used.
Böhm.	Niederbronn	131	11.5	Typhoid fever. Military hospital.
Gersauer.	Vigy.	97	6.18	Typhoid fever. Mortality on expectant treatment 23.91 per cent.
Drasche.	Vienna.	55	19	Typhus.
Merkel.	Nuremberg.	41	2.2	Typhus fever.
Loebel.	Vienna.	87	18.4	Typhoid fever.
"	"	105	28.6	Typhus fever. The treatment in this and in the preceding case was not thoroughly carried out; the patients mostly receiving only three baths a day.
Glénard.	Lyons.	52	0	Typhoid fever.
Schmidt.	Erlangen.	56	0.18	Several fatal cases not counted, because not received until the fifteenth day, and, therefore, too late to test the treatment; they bring the total mortality to 4.14 per cent.
Heubner.	Leipsic.	72	0.14	
Binz.	Versailles.	190	2.1	Soldiers. Mostly, if not all, typhoid fever.
Zeroni.	Mannheim.	72	18	Soldiers.
Valette.	Lyons.	21	0	Typhoid fever.

This table is of such a character that any lengthy discussion of it seems unnecessary. It is, however, allowable to call attention to the facts that the failure of the method at Vienna is, by the upholders of it, very

from the distal end is conducted, as nearly level as possible, to what may be termed a glass bucket, which hangs exactly counterpoised in a mixture of alcohol and water, from a ribbon running over a pulley. To the other end of the ribbon is attached the pen which is to trace the expected curve upon a rotating drum.

The arm having been introduced, and its owner placed in a comfortable sitting position, the case is completely filled with water, as is also the tube which runs from it. Enough water is also in the bucket to cover the end of this tube.

If now the volume of the enclosed extremity increases from any cause, water is pressed out of the case through the tube into the bucket, which becomes heavier and descends, thereby causing a motion of the pen in an upward direction. If, on the other hand, the volume of the extremity diminishes, then the water in the bucket is driven back to the case by atmospheric pressure, and, the bucket itself rising, a motion in the opposite direction is communicated to the pen.

The various difficulties which arose in the path of the inventor of this apparatus, not the least of which were the fact that the bucket underwent a progressive loss of weight as it descended into the fluid under it, and the necessity of providing against an overflow from the necessarily small bucket in case the extremity expanded very much, have been most ingeniously surmounted, and the apparatus as exhibited last night before the Society worked admirably, as it has done during other experiments which I have witnessed.

Besides exhibiting his apparatus, from my necessarily imperfect description of which I trust some idea may be gained, Dr. Mosso showed a number of tracings taken under different circumstances, and from these and his remarks it seemed plain that he had devised a means for studying the increase in volume of the blood-vessels of the extremities, and, through observations upon these, of gaining information with regard to the condition of the blood-vessels of the brain,—information of value not only from a physiological stand-point, but also in the solution of some questions in experimental pharmacology, and perhaps in clinical medicine. In passing, it is worth while mentioning that Prof. Wunderlich, who was present last evening, has already taken steps towards some investigations with the instrument in the hospital.

The tracing obtained from a man who sits perfectly quiet, and with his mind in as placid a condition as possible, is, so to speak, a straight line, varied at regular intervals by the respiration, and at irregular intervals by certain unexplained and small changes of volume which are not coincident in both arms. The latter are termed "spontaneous" movements, and both are readily allowed for in observing the curves, as they present distinctive appearances.*

When, now, the apparatus is in working order, the blood-vessels are observed to change their volume in the most remarkable and hitherto unsuspected manner. Volatile substances, as ammonia, held under the nose for a moment, as well as touching the other hand with a piece of ice, caused a decided alteration in the amount of water in the case. In each instance the volume of the arm decreased. Besides these phenomena which were shown, Dr. Mosso showed the tracings and described some of the phenomena which showed themselves when the subject of the experiments was Dr. Pagliani, a friend who on several occasions submitted himself to what must certainly be a somewhat wearisome process.

In Pagliani's case, a cup of coffee was sufficient to cause a decided contraction of the blood-vessels of the arm, which lasted for three-quarters of an hour, while, on the other hand, on one occasion, while he slept the arm increased very greatly in volume, and the "spontaneous movements" were much greater.

During this sleep, the barking of a dog, the striking of the clock, and a slight touch upon the cheek, caused a temporary, but not complete, reduction of volume. On waking, Pagliani remembered nothing of the sounds or the touch. Before his waking the vessels again contracted, and when he was fully conscious they had resumed their original condition. The speaker drew from this and another similar experiment the conclusion that consciousness is only possible when the blood-vessels contract strongly, and the blood streams from the periphery to the centre.

On one occasion, when Dr. Pagliani was perfectly quiescent, the sudden though quiet entrance of Prof. Ludwig caused a most marked contraction of the blood-vessels of the arm; and indeed when Mosso himself or others of the students in the Physiological Institute were the subjects of experiment, this same contraction took place, showing, as the lecturer said, when one considers the close and friendly, one might almost venture to say familiar, relation in which Prof. Ludwig stands to his pupils (thereby eliminating alarm or uneasiness from the question), with what veneration and respect he was regarded by them, as in silence their very blood-vessels drew together to do him honor.

Invariably it has been found that the slightest mental effort is accompanied by a reduction in the volume of the arm; a comparatively simple sum in multiplication producing a very marked effect.

In connection with this point, Dr. Mosso related a story of his experience in Turin with a friend of a literary turn and a good classical scholar. The latter entered his room while he was occupied over his apparatus, and asked of what possible use such an affair could be. "It will tell whether you are as well up in Greek as in Latin," replied Mosso, and thereupon, copying off a page of Latin and one of Greek, he put his unfortunate friend into the machine, and asked him to read both pages. The Latin came first, and the arm-volume remained stationary; but when the Greek was begun there was a sudden and great alteration, the arm-volume diminishing.

As may be imagined, the address was exceedingly interesting; and it is a matter for congratulation that

* The pulse also makes a slight impression.

Dr. Mosso is still prosecuting his investigations, which it is to be hoped will finally see light in an extended and complete form. I should not omit to say that the alterations caused by muscular contraction are only avoided through the intelligence of those upon whom the experiments are made; but it is quite safe to "stigmatize" those who have been the subjects here, as Helmholtz did his friends, as persons of perhaps more than ordinary intelligence; besides, the alterations of volume from muscular movements can be readily recognized, and the experiment repeated or allowance made for the error.

Dr. Mosso's address was attentively listened to, and warmly received. He mentioned many experiments with various drugs; among others, one with nitrite of amyl, when there was a slow but perceptible contraction[?] of the vessels. This, however, and other similar observations, he will be able, he trusts, to work up more fully later. In this hope he is supported by those whom he yesterday addressed, all of whom seemed convinced that the new plethysmograph will be found a valuable aid to scientific research, especially in the hands of so careful an investigator as its inventor.

H. B. HARE.

AMERICAN MEDICAL ASSOCIATION.

TO THE EDITOR OF THE PHILADELPHIA MEDICAL TIMES:

THE object of this communication is to call attention to the American Medical Association, whose twenty-sixth annual meeting will take place at Louisville, Kentucky, on the first Tuesday of May next. Instituted in 1847, through the influence and exertion mainly of one man,—Prof. Davis, then of Binghamton, and now of Chicago,—the Association has had, if not a brilliant career, certainly a very satisfactory one, despite the numerous attempts, private and public, which have been made from time to time to disparage and dishonor it. I express this conviction without the slightest fear of successful contradiction; for I profess to have some knowledge of its history, of its proceedings and transactions, and of the men who have been connected with it, either as members or officers. Of the latter there is a long list of names of which any medical association might well be proud; men who have illustrated their profession by their labors and writings, and have added lustre to their age and country. The meetings have been, for the most part, well attended. During its session in this city in 1872, nearly eight hundred delegates were present; and last June, at Detroit, there were upwards of five hundred, and it is perfectly certain that if a more central point had been selected, the number would have been much larger. As it was, there were very few delegates from the Eastern, Middle, and Northern States. Nevertheless, the meeting was a highly respectable one, not only in relation to members but also in regard to talent, learning, and scientific attainments. What more especially impressed me was the great number of elderly, gray-headed men present on the occasion, men who had come from great distances to take an active part in the proceedings of the Association and to show their interest in its welfare and prosperity. Another circumstance which could not fail to strike every spectator was the decorum which characterized the proceedings of the meeting. The sections accomplished a great deal of work, and the discussions in most, if not all of them, were animated and interesting. As respects the social aspect of the meeting, nothing could have been more gratifying. The citizens of Detroit literally vied with one another to make the occasion one of high social enjoyment. Their hospitality was absolutely unbounded, and will long be remembered by every member of the Association.

In the face of all these facts, I was not a little surprised last summer when I saw an editorial statement in the *Times* that the meeting had been a failure, inasmuch as, it was alleged, it did not represent the American medical profession, owing to the absence of many of its best and most distinguished members. This, it seems to me, is begging the question. No rational person would expect that all the most prominent members of the profession would attend every meeting. Philadelphia, Baltimore, New York, and Boston, for example, were all poorly represented. Many of the great lights in all those cities were absent; and you, yourself, remained away, snugly ensconced behind your editorial tripod, or, it may be, engaged upon some experiment intended to elucidate some obscure point in the physiology of the nervous system, or the action of some article of the materia medica. Why the meeting at Detroit should be denounced because of the absence of those lights passes understanding. Did those men remain away because they felt indifferent respecting the success of the meeting? Was it because they dreaded a journey of six, seven, or eight hundred miles in the heat and dust of summer? Finally, was it because the physicians of the Eastern, Northern, and Middle States supposed they might lose some of their effulgence by contact with the Western and Southwestern members of the profession? Whatever the cause may have been, it reflects no credit upon those sections of the country that they permitted their representative men—*those great lights* of the profession, as you regard them—to remain at home, while their more humble but more active and industrious brethren of the great West were zealously laboring and spending their time and money in upholding an Association which, to say the least of it, has done more in harmonizing, unifying, and socializing the medical profession of this country than all the medical societies, great and small, civic and rural, that have ever been formed on this continent. Taking this view of the subject,—and no unprejudiced man acquainted with it can look upon it in any other light,—is it not our solemn duty to sustain the Association, instead of decrying and undermining it by insinuations of failure, if not actual abuse for any of its short-comings? The old adage, "Give a dog a bad name and you might as well hang him," has a powerful significance here. Some men—certain editors in particular—think it their duty to disparage everything Ameri-

Henry.

Henry Hartshorn.

Has three leading traits of character. They are 1 Causation. He is not particularly smart & brilliant but has depth & solidity - is original & reasons more than remembers - learns by means of his understanding more than of memory, & makes remarks that appertain to some important principle, rather than to fact. His is a why & because mind, rather than a what & what

intellect. He asks many questions — & those that are difficult to answer. He has excellent judgment — much contrivance & a power of adapting means to ends rarely to be met with. He also draws close & correct lines of demarkation — discriminates well & will have an inductive philosophizing mind. To this he adds great powers of application, abstraction & continuity of mind.

He takes the ipse dixit of no one, & thus refuses to believe till the subject is fully explaind to him Secondly. He is indipendent - thinks his own way best - a little wilful - wise in his own eyes - refuses advice, & will have his own way. He is also manly, can be made a compainon of - has as much self respect & character as usually belong to persons much older than himself - cannot be drum, & may as be allowed to govern himself first as last

He can never be conquered
nor crushed by difficulties
nor will he do a small
business but will move
in a conspicuous
sphere.
He has a good command
of words — might write
well — is a winter apple
slow to ripen but all
the better for that &
will last the longer.
Third
He is remarkable
for his great construc-
tive & mechanical
powers — yet will invent
& fashion better than
copy — also uses tools
well & acts many ~~trades~~

figures with the pen & pencil. He might draw.

He tells the whole truth & is candid & sincere & will do his work openly & above board.

He will do well to cultivate Selfgovernment for he throws out his mind too forcibly.

He has rather too good a conceit of himself & is freemement for his integrity gratitude & sense of right & justice. He has good ideas yet not so quick perceptions. C S Fowler.

[Entered according to Act of Congress, in the year 1838, by O. S. FOWLER, in the Clerk's Office of the Eastern District of Pennsylvania.]

SYNOPSIS OF PHRENOLOGY;

AND THE

PHRENOLOGICAL DEVELOPEMENTS,

TOGETHER WITH

THE CHARACTER AND TALENTS,

OF

Henry Hartshorn.

AS GIVEN BY

O. S. Fowler. May 3d 1839.

WITH REFERENCES TO THOSE PAGES OF "PHRENOLOGY PROVED, ILLUSTRATED, AND APPLIED," IN WHICH WILL BE FOUND A FULL AND CORRECT DELINEATION OF THE INTELLECTUAL AND MORAL CHARACTER AND MANIFESTATIONS OF THE ABOVE-NAMED INDIVIDUAL.

BY O. S. FOWLER, A.B.

AUTHOR OF "PHRENOLOGY PROVED, ILLUSTRATED, AND APPLIED;" "ANSWER TO VINDEX;" "THE NATURAL THEOLOGY OF PHRENOLOGY," &c. &c.

FOR SALE, WHOLESALE AND RETAIL,

BY FOWLER AND BREVOORT,

PRACTICAL PHRENOLOGISTS,

AT THE PHRENOLOGICAL ATHENÆUM,

210 Chestnut street, Philadelphia.

FIFTH EDITION.

EXPLANATION.

THE PROPORTIONATE SIZE of the phrenological organs of the individual examined, and, consequently, the *relative* power and energy of his primary mental powers; that is, *his moral and intellectual character and manifestations*, will be indicated by the *written* figures 1, 2, 3, 4, 5, 6, 7: figure 1 signifying VERY SMALL; 2, SMALL; 3, MODERATE; 4, AVERAGE; 5, FULL; 6, LARGE; 7, VERY LARGE.

In order to make the indications still plainer, these figures will be written *opposite* to those lines which describe the individual examined; and at the *end* of these lines, figures are placed which refer to those pages of "Phrenology Proved, Illustrated, and Applied," in which will be found a full description, as well of his *individual* characteristics as of the results of feelings, character, talents, capabilities, &c. produced by the *combined* operation of his faculties in that degree in which he possesses them.

EXPLANATION OF THE CUTS. (abbreviated c.) Cut 1 shows the *location, number*, and abbreviated *name* of the organs: 2, their *general divisions* or *classification*: 3, 4, present occipital and frontal views of the organs: 5 is a profile cut of Washington: 6, of Franklin: 7, of Herschel: 8, 9, of Le Blanc, the murderer of Judge Sayre and family, of N. J.: 10 represents a well balanced, or perfect head: 11 is a cut of a highly intellectual female, and one endowed with great versatility of talents: 12, 13, are cuts of Me-che-Ke-le-a-tah, the celebrated war-chief of the Miami Indians: 14 is a cut of Aurelia Chase, murderer of Dr. Durkey's wife, Balt.: 15, of Black Hawk: 16, 17, of an Indian chief: 18, of De Witt Clinton: 19, of Brunell, engineer of the Thames tunnel, Eng.: 20, of Philip, a notorious thief and liar, (p. 320): 21, 27, of a skull found on the British lines at York town, Va.: 22, 23, of a remarkably intelligent monkey: 24, 32, of a hyena: 25, 26, of a N. A. Indian: 28, of an idiotick child: 29, of a full-grown idiot: 30, 37, of an ichneumon: 31, 36, of a fox: 34, crow: 37, 43, of a very cunning and roguish cat: 40, of Shakspeare, from an English portrait, said to be the most correct extant: 41, of Robert Hall: 42, a New Zealander.

[The small figures (second row,) placed before the names of the organs, are the numbers of *Spurzheim*.]

DEFINITIONS.—1, or VERY SMALL, means almost wholly wanting: 2, or SMALL, feeble and inactive; 3, or MODERATE, signifies rather below mediocrity; active only in a subordinate degree; and having only a limited influence upon the mind and character: 4, or AVERAGE, means fair, or between moderate and full, and includes the general analysis of the faculties: 5, or FULL, signifies respectable, though not marked or controlling: 6, or LARGE, applied to an organ, shows that its corresponding faculty has a powerful and an energetick influence upon the capabilities and *feelings*, if not conduct: 7, or VERY LARGE, means predominant, especially over the less energetick faculties; constituting and giving tone and direction to the character and talents; easily excited, and powerful in action; and quite liable to perversion and abuse.

The *size of the head* of the individual examined, the *degree of activity*, the *quantum*, or *amount*, of mental strength and power, the *sharpness* and the *smoothness* of the phrenological organs, and the corresponding *degree of excitability* of the faculties, and the various *proportions of the temperaments*, together with the relative development of the several *classes* of organs, will be indicated in the same manner. The cuts do not show the *relative* size.

The sign +, (plus, or more,) placed before or after a figure, shows that it is *larger* than it is marked, yet not enough so to require the next larger figure: the sign —, (minus, or less,) that it is not quite as much as it is marked. These signs add and diminish nearly one-half of a degree.

Excesses and defects of character are marked by *curved* dashes. A curved dash drawn *under* a figure, thus 6̆, or 7̆, indicates that the organs thus marked, considered in reference to their combinations, are liable to be *over exercised*, or perverted, and require to be closely watched and judiciously directed, or else restrained; a curved dash drawn *over* a written figure, thus 2̂, signifies that the weakness of the faculty thus marked, constitutes a palpable *defect* of character, and that it should be cultivated and stimulated.

The *printed* figures in the margin, refer to the *number* of their respective faculties, or the *order* in which they are described, and the figures in the cuts, to the *location* of the corresponding faculties in the head, except the figures *under*, or in the *open parts* of the *cuts*, which refer to *their* number.

PHRENOLOGY.

Develops and points out those relations which exist between certain *conditions and developments of the brain, and the manifestations of the mind.* For a statement of the fundamental principles of this science, the reader is referred either to the cover of this synopsis, or else to pp. 7—36, of "Phrenology Proved," &c. We have here only room to allude briefly to the *principal* conditions upon which the mental manifestations are found to depend.* These are mainly as follows.

I. The size of the brain, other conditions being equal, is found to be the measure of the *aggregate* amount of the mental power; and the relative size of the several *organs* of an individual, indicates the proportional strength and energy of his corresponding *faculties.*

It should, however, be remembered, that the *amount* of one's mental power, depends even more upon these "*other conditions,*" such as his organization, or the vigour of his constitution, the condition of his nutritive organs, the state of his health, his temperament, the amount of excitement under which his various faculties act, his education, habits, diet, &c., than upon the *size* of his brain alone. Accordingly, in consequence of different degrees of health, rest, fatigue, excitement, &c., the manifested *quantity* or *amount* of a man's mental power, will vary twenty, forty, and even eighty per cent., whilst the *kind* or *quality* will differ little if any. Hence, both in proving phrenology, and also in applying its principles, the province of the phrenologist is to point out the *character* or *kind* of talents and mental power, rather than their precise *amount;* and yet, if he is informed as to these "other conditions," (and it is not only his *right* to know them, but preposterous in him to pronounce without such knowledge,) he can ascertain very nearly the *amount,* as well as the kind, of intellect and feeling.

Average.—One having an average-sized brain, with activity only *average,* will discover only an ordinary amount of intellect; be inadequate to any important undertaking; yet, in a small sphere, or one that requires only a mechanical routine of business, may do well: with activity *great or very great,* and the organs of the propelling powers and of practical intellect, large or very large, is capable of doing a fair business, and may pass for a man of some talent, yet he will not be original nor profound; will be quick of perception; have a good practical understanding; will do well *in his sphere,* yet never manifest any traces of greatness, and out of his sphere, be common-place: with *moderate or small* activity, will hardly have common sense.

Full.—One having a full-sized brain, with activity *great or very great,* and the organs of practical intellect and of the propelling powers, large or

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* The succeeding descriptions, and also those referred to in "Phrenology Proved," &c., are predicated on the supposition that the brain is full or large in size—the organization sound—health fair or good—activity full or great; and that the faculties have not been *mis*-directed.

For the effects of the *combined* action of the faculties, which constitute by far the most important portion of phrenology, or, rather, its very *essence,* and without a knowledge of which no correct estimate of character can be formed, the reader is referred to "Phrenology Proved," &c., the main design of which is to present this hitherto neglected, but all important, feature of this subject.

Before the terms Average, Full, Large, Very Large, Moderate, Small, and Very Small, the reader will please supply the ellipsis, *one having this organ.*

very large, although he will not possess *greatness* of intellect, nor a deep, strong mind, will be very clever; have considerable talent, and that so distributed that it will show to be *more* than it really is; is capable of being a good scholar, doing a fine business, and, with advantages and application, of distinguishing himself somewhat, yet he is inadequate to a great undertaking; cannot sway an extensive influence, nor be really great: with activity *full or average*, will do only tolerably well, and manifest only a common share of talents: with activity *moderate or small*, will neither be nor do much worthy of notice: c. 15. 43.

Large.—One having a large-sized brain, with activity *average*, will *possess* considerable energy of intellect and feeling, yet seldom manifest it unless it is brought out by some powerful stimulus, and will be rather too indolent to exert, especially his *intellect:* with activity *full*, will be endowed with an uncommon amount of the mental power, and be capable of doing a great deal, yet require considerable to awaken him to that vigorous effort of mind of which he is capable; if his powers are not called out by circumstances, and his organs of practical intellect are only average or full, he may pass through life without attracting notice, or manifesting more than an ordinary share of talents: but if the perceptive faculties are strong or very strong, and his natural powers put in vigorous requisition, he will manifest a vigour and energy of intellect and feeling quite above mediocrity; be adequate to undertakings which demand originality of mind and force of character, yet, after all, be rather indolent (c. 18): with activity *great or very great*, will combine great *power* of mind with great activity; exercise a commanding influence over those minds with which he comes in contact; when he enjoys, will enjoy intensely, and when he suffers, suffer equally so; be susceptible of strong excitement, and, with the organs of the propelling powers, and of practical intellect, large or very large, will possess all the mental capabilities for conducting a large business; for rising to eminence, if not to pre-eminence; and discover great force of character and power of intellect and feeling: with activity *moderate*, when powerfully excited, will evince considerable energy of intellect and feeling, yet be too indolent and too sluggish to do much; lack clearness and force of idea, and intenseness of feeling; unless literally driven to it, will not be likely to be much or do much, and yet actually *possess* more vigour of mind, and energy of feeling, than he will manifest; with activity 1, or 2, will border upon idiocy.

Very Large.—One having a very large head, with activity *average* or *full*, on great occasions, or when his powers are thoroughly roused, will be truly great; but upon ordinary occasions, will seldom manifest any remarkable amount of mind or feeling, and perhaps pass through life with the credit of being a person of good natural abilities and judgments, yet nothing more: with activity *great*, strength, and the intellectual organs the same, will be a natural genius; endowed with very superior powers of mind and vigour of intellect; and, even though deprived of the advantages of education, his natural talents will surmount all obstacles, and make him truly talented (c. 7): with activity *very great*, and the organs of practical intellect and of the propelling powers large or very large, will possess the first order of natural abilities; manifest a clearness and force of intellect which will astonish the world, and a power of feeling which will carry all before him; and, with proper cultivation, enable him to become a bright star in the firmament of intellectual greatness, upon which coming ag s

may gaze with delight and astonishment. His mental enjoyment will be most exquisite, and his sufferings equally excruciating: c. 5. 6. 40. 41.

MODERATE.—One with a head of only moderate size, combined with *great* or *very great activity*, and the organs of the propelling powers and of practical intellect, will possess a tolerable share of intellect, yet appear to possess much more than he does; with others to plan for and direct him, will perhaps execute to advantage, yet be unable to do much alone; will have a very active mind, and be quick of perception, yet, after all, have a contracted intellect (c. 10. 26); possess only a small mental calibre, and lack momentum both of mind and character: with activity only *average or fair*, will have but a moderate *amount* of intellect, and even this scanty allowance will be too sluggish for action, so that he will neither suffer nor enjoy much: with activity *moderate or small*, be an *idiot*.

SMALL OR VERY SMALL.—One with a small or very small head, no matter what may be the activity of his mind, will be incapable of intellectual effort; of comprehending even easy subjects; or of experiencing much pain or pleasure; in short, will be a natural fool: c. 28. 29.

5 II. THE STRENGTH OF THE SYSTEM, including the brain, or what is the same thing, upon the *perfection or imperfection of the organization*. Probably no phrenological condition is so necessary for the manifestation of mind, as a strong, compact constitution, and energetick physical powers. Even after a violation of the laws of the organization has brought on disease, a naturally vigorous constitution often retains no small share of its former elasticity and energy, and imparts the same qualities to the mental operations (c. 5. 6. 7. 12. 15. 18. 40. 41. 43); but, in proportion as this is defective, weakness and imbecility of mind will ensue.

4 III. THE DEGREE OF ACTIVITY.—In judging of the manifestations of the mind, the *activity* of the brain is a consideration quite as important as its size. Whilst size gives power or momentum of intellect and feeling, activity imparts quickness, intensity, willingness, and even a restless desire, to act, which go far to produce efficiency of mind, with accompanying effort and action. Under the head of size, however, the effects of the different degrees of *activity* were presented, and need not to be repeated here.

4 IV. UPON THE EXCITABILITY.—Sharp, or pointed and prominent organs, always accompany a nervous and very excitable temperament; moderate or average sized head; sharp teeth and pointed bones; sprightliness of mind and body, &c.

POINTED OR VERY POINTED.—One with a head uneven, or very uneven, peculiar in shape, and having a great many protuberances and depressions, or hills and valleys on it, has an equally peculiar, eccentrick, *sui-generis* character; presents many strong and weak points of mind and character; is too much the sport of circumstances; lacks uniformity and consistency of character, opinion, and conduct; is likely to be driven back and forth by strong excitements and counter-excitements, and thus to have a rough voyage through life; to experience many remarkable incidents, hair-breadth escapes, &c.; in short, to do and say many singular things.

3 MODERATELY SMOOTH.—One with a round even head, is likely to manifest uniformity and consistency of character; to have good sense and judgment; to have few excesses or deficiences; and, like the poet's good man, "*holds the even tenour of his way*," passing smoothly through life.

V. Upon the TEMPERAMENT, by which term phrenologists designate

the degree of energy with which various classes of the corporal organs operate. With some propriety, they describe *four* temperaments.

1. The Lymphatick, or that in which the various secreting glands are the most active portion of the system, produces an ease-seeking disposition of mind and body, and aversion to effort. Hence it tends to lengthen out life, as is evident from its predominating more in young children and advanced age. Signs: soft and abundant flesh; slow but steady pulse; love of ease; light hair; and great size of the abdominal viscera. The author regards this temperament in a more favourable light than do most other phrenologists: p. 39. c. 7. 41.

2. The Sanguine, or that in which the *arterial* portion of the system, which gives circulation to the various *fluids*, particularly the blood, predominates in activity, is accompanied with strong feelings, warm passions, and a great amount of ardour, zeal, activity, and warmth of feeling, yet with less endurance and power. Its predominance indicates a strong constitution; love of physical pleasure; and a stirring, business talent: combined with much of the lymphatick, it is less favourable to the *mental* manifestations, and requires much exercise in the open air. Signs: sandy or auburn hair; fair skin; a fresh, florid countenance; blue eyes; a strong, rapid pulse; warm passions; a deep and broad chest and shoulders; a stout, well built frame; &c.: p. 39.

3. The Bilious, or that in which the *osseous* and *muscular* portions of the system predominate in activity, produces great physical strength; endurance and power both of body and mind; with great force and energy of mind and character. Signs: a bony, muscular, athletick frame; black hair; dark skin; dark eyes; a strong, steady pulse; hardness of flesh; bones projecting; &c.: p. 39. c. 5. 12. 13. 15. 16.

4. The Nervous, or that in which the brain and the nerves predominate in activity, gives clearness of perception; quickness of mind and body; susceptibility to excitement, with less power and endurance. Signs: light, fine, and thin hair; a thin, clear, delicate skin; smaller frame; head relatively large; small chest; rapid, but not hard or strong pulse; &c.: p. 39. c. 10.

The nervous predominant, with a large share of the bilious and sanguine, combines a great amount of power and endurance of mind and body, with great activity and excitability; and is more favourable to intellectual pursuits, and vigour of thought and feeling, than perhaps any other When one of this temperament enjoys, he enjoys intensely, and when he suffers, his sufferings are extremely excruciating: c. 6. 11. 15. 40. 43.

The sanguine-bilious is not an unfavourable temperament, nor particularly favourable, but whilst it gives a great amount of mental *power*, it is frequently, though not always, coupled with some manifest deficiency.

The nervo-bilious unites great power with great activity, and, although it seldom gives great brilliancy, it produces that *kind* of talent which will stand the test, and shine in proportion as it is brought into requisition. A good share of the sanguine added, is more favourable to the manifestations of mind, and also, of physical power, than probably any other: c. 6. 41.

The bilious, combined with the lymphatick, gives considerable power of mind, and strength of body, accompanied with so much heaviness and indolence as to be less favourable; yet, if one with this temperament acts under strong excitement, his efforts tell with power upon the object in view: c. 7.

The nervo-sanguineous, with but little bilious, gives extreme intensity of action, and perhaps brilliancy of talent with vivid feelings and concep-

tions, yet, for want of the strength imparted by a bilious temperament, the mental operations will be flashy, vapid, and too intense to remain long enough to amount to much, the activity being too great for the strength.

The temperaments are capable of being greatly modified, and their proportion even radically changed, by the habits, diet, exercise, &c., of the individual. The hard-working man, who exercises his muscles mainly, and cultivates but little sensitiveness, either of body or feeling, and the fashionable belle, who experiences the other extreme of excessive sensibility, both physical and mental, will serve to illustrate this point.

The author is of opinion, that, in the case of the temperaments, as in that of the several organs, the nearer equal they are, the better for the manifestation of both the physical and mental energies, and for long life.

THE PROPELLING OR EXECUTIVE FACULTIES.—One having combat., destruct., firmness, self-esteem, hope, &c., large or very large, and an active brain, has impetus, enterprise, and efficiency, and *drives* what he takes hold of: these faculties being to the mind what steam is to the engine, or wind to the sail. Large in c. 5. 6. 12. 15. 16. 18. 40. 41. 42.

AVERAGE OR FULL, is between one with these organs large and small.

MODERATE OR SMALL, takes hold of things softly and with mittens on; lacks efficiency; and has not enough "go ahead" in him: c. 10. 21. 26.

ANALYSIS AND CLASSIFICATION OF THE FACULTIES.

GENUS I. AFFECTIVE FACULTIES, OR FEELINGS. These occupy the back and upper portions of the head, where the hair appears, and originate the feelings, emotions, sentiments, passions, &c.: p. 45.

SPECIES I. *Domestick Propensities, or Family and Social Feelings.* AVERAGE OR FULL, loves and enjoys his family, yet not *passionately.* LARGE OR VERY LARGE, sets every thing by his family; is an affectionate companion and parent; very happy with, and miserable without or away from, his home and family, &c.: c. 5. 10. 11. 12. 14. 15. 42. MODERATE OR SMALL, is not well qualified to enjoy or perform family or social duties and relations; considers other interests as paramount.

1. 2 AMATIVENESS.—*Reciprocal attachment and love of the sexes.* AVERAGE, loves the other sex, and enjoys their society, well: c. 10. 11. FULL, feels much love and tenderness for the opposite sex; is fond of them, yet, with activity great, has *excitability* rather than power: p. 59. LARGE, is an ardent admirer and tender lover of the person and company of the other sex; capable of intense connubial attachments; feels strong sexual impulses, desire to marry; &c.: p. 57. c. 5. 7. 12. 15. 16. VERY LARGE, is even *passionately* fond of the other sex; experiences a power and activity of sexual love almost uncontrollable: p. 58. c. 14. MODERATE, is rather deficient in sexual love, attentions to the opposite sex, &c.; may have ardour, yet less strength, of this passion: p. 59. 43. SMALL, feels little sexual or connubial love, or desire to marry: p. 59. VERY SMALL, seldom or never experiences this feeling: p. 60. c. 29. 31.

2. 3. PHILOPROGENITIVENESS.—*Parental attachment; love of one's offspring; fondness for pets, young and tender animals, &c.*: p. 61. AVERAGE, loves his own children, yet not fondly, dislikes those of others. FULL, as a parent, is tender, but not indulgent; fond of his own children, yet not partial to others; bears little from them: p. 63. c. 8. 11. 15. LARGE, feels strong, tender parental love; is devotedly attached, and very

Fond of mother & this is reciprocate.

kind, to his own, if not all, children, to pets, &c.: p. 62. c. 12. 16.
VERY LARGE, is *passionately* fond of all children, of pets, &c.; a general favourite with them; very indulgent and playful; idolizes his own children; is liable to over-indulge them: p. 63. c. 10. 14. 20. 21. 22. 42.
MODERATE, loves his own children some, yet bears little from them; dislikes those that are young, or not his, or troublesome: p. 64.
SMALL, feels little interest in even his own children, much less in those of others; is liable to treat them unkindly: p. 64. c. 26.
VERY SMALL, has no parental love; hates all children: p. 64. c. 30.

3. 4.* ADHESIVENESS.—*Friendship; social feeling; love of society.*
AVERAGE, is quite friendly, yet will not *sacrifice* much for friends.
FULL, is highly social, yet not *remarkably* warm-hearted: p. 66. c. 16.
6. LARGE, is *eminently* social, an ardent, sincere friend; enjoys friendly society extremely; forms strong, if not hasty, attachments: p. 65. c. 11.
VERY LARGE, loves friends with indescribable tenderness and strength of feeling; will sacrifice almost every thing upon the altar of friendship; with amat. full or large, is susceptible of the most devoted connubial love; falls in love easily: p. 65. c. 10. 14. 20. 21. 42.
MODERATE, loves friends some, yet self more; quits friends often: p. 67.
SMALL, is unsocial, cold-hearted, likes and is liked by few or none: p. 67.
VERY SMALL, is a stranger to friendly social feeling: p. 67. c. 24. 32.

4. 5. INHABITIVENESS.—*Love of home as such; attachment to the place where one has lived; unwillingness to change it; patriotism.*
AVERAGE, forms some, though not strong, local attachments: c. 8. 12.
FULL, loves home well, yet does not grieve much on leaving it: p. 69.
LARGE, soon becomes *strongly* attached to the *place* in which he lives; loves home and country *dearly;* leaves them reluctantly; is unhappy without a home of his own: p. 68. 6. 12. 14. 15. 16. 21.
VERY LARGE, regards *home* as the dearest, sweetest spot on earth; feels homesick when away; dislikes changing residences; is *pre-eminently* patriotic; thinks of his native place with intense interest: p. 68. c. 5.
MODERATE, has some, but no great, regard for home *as such:* p. 69. c. 26.
2 SMALL OR VERY SMALL, forms few local attachments; cares little where he is; makes any place home; leaves and changes residences without regret: p. 69. *(The number according to Spurzheim.)

5. CONCENTRATIVENESS.—*Unity and continuity of thought and feeling; power of entire and concentrated application to one thing.*
AVERAGE, possesses this power to some, though to no great, extent.
5 FULL, is disposed to attend to but one thing at once, yet can turn rapidly from thing to thing; is neither disconnected nor prolix: p. 71. c. 15
to 6 LARGE, is able and inclined to apply his mind to one, and but one, subject for the time being, till it is finished; changes his mental operations with difficulty; is often prolix: p. 72. c. 12. 42.
VERY LARGE, places his mind upon subjects slowly; cannot leave them unfinished, nor attend to but *one* thing at once; is *very* tedious; has great application, yet lacks *intensity* and *point:* p. 70.
MODERATE, loves and indulges *variety* and *change* of thought, feeling, occupation, &c.; is not confused by them; rather lacks application; has *intensity*, but not *unity*, of the mental action: p. 71. c. 16.
SMALL, craves novelty and variety; has little application; thinks and feels intensely, yet not long on any thing, jumps rapidly from premise to conclusion; fails to *connect* and *carry out* his ideas &c.: p. 71. c. 14.

VERY SMALL, is restless; satisfied only by *constant succession*: p. 72. This faculty is *sui generis*, and affects both feeling and intellect.

SPECIES II. SELFISH PROPENSITIES. These provide for the various *animal* wants; have reference to the necessities, desires, and gratifications of their possessor; and terminate upon his sensual interests and wants.

LARGE OR VERY LARGE, has strong animal desires; is strongly tempted to gratify them; prone to be selfish, unless the moral sentiments are still stronger; and will take good care of number *one*: c. 8. 12. 14. 15. 16. 20.

MODERATE OR SMALL, is not selfish enough; easily trode upon; needs to have some one to take care of him; and cannot give himself up to low-lived, sensual pleasures: c. 10. 11. 12. 41.

A. VITATIVENESS.—*Love of existence* AS SUCH, *dread of annihilation.*

AVERAGE, is attached to life, and fears death, yet not a great deal.

FULL, desires life, but not eagerly, from love of it and of pleasure: p. 74.

LARGE, loves, and clings tenaciously to, existence, *for its own sake;* craves immortality and dreads annihilation, even though miserable: p. 74.

VERY LARGE, however wretched, shrinks from, and shudders at the thought of, dying and being dead; feels that he cannot give up existence: p. 74.

MODERATE, loves life, yet is not *very* anxious about living: p. 74.

SMALL OR VERY SMALL, heeds not life or death, existence or annihilation.

6. 6. COMBATIVENESS.—*Feeling of resistance, defence, opposition; boldness, willingness to encounter; courage, resentment, spirit:* p. 75.

AVERAGE, is pacifick, but, when driven to it, defends his rights boldly; avoids collision, strife, &c., yet, once excited, is quite forcible.

5 FULL, seldom either courts or shrinks from opposition; when roused, is quite energetick; may be ~~quiet~~ tempered, yet is not contentious: p. 78. quick

LARGE, is resolute and courageous; spirited and efficient as an opponent; quick and intrepid in resistance; loves debate; boldly meets, if he does not court, opposition: p. 75. c. 5. 15. 8. 16.

VERY LARGE, is powerful in opposition; prone to dispute, attack, &c.; contrary; has violent temper; governs it with difficulty: p. 77. c. 12. 14.

MODERATE, avoids collision; is rather pacifick and inefficient: p. 78.

SMALL, has feeble resistance, temper, force, &c.; is cowardly: p. 79.

VERY SMALL, withstands nothing; is chickenhearted; an arrant coward.

7. 1. DESTRUCTIVENESS.—*Executiveness; indignation; force; severity; sternness; a destroying, pain-causing disposition:* p. 82

4 AVERAGE, has not really *deficient*, yet none too much, indignation. 19.

FULL, can, but is loath to, cause or witness pain or death; has sufficient severity, yet requires considerable to call it out: p. 83. c. 5. 11.

LARGE, when excited, feels deep-toned indignation; is forcible, and disposed to subdue or destroy the *cause* of his displeasure: p. 82. c. 5. 89.

VERY LARGE, when provoked, is vindictive, cruel, disposed to hurt, take revenge, &c.; bitter and implacable as an enemy; *very* forcible: p. 83. c. 12. 13. 14. 15. 16. 17. 24. 25. 26. 32. 33. 35. 42.

MODERATE, is mild; not severe nor destructive enough; when angry, lacks power; can hardly cause or witness pain or death: p. 84. c. 10. 41.

SMALL, would hardly hurt one if he could, or could if he would; has so feeble anger that it is derided more than feared: p. 84. c. 21. 27.

VERY SMALL, is unable to cause, witness, or endure pain or death: c. 48.

8 * ALIMENTIVENESS.—*Appetite for sustenance; cause of hunger.*

AVERAGE, enjoys food well, but not very well; hence is particular: c. 41.

FULL, has a good appetite, yet can govern it well; is not greedy: p. 87. 7.

6 LARGE, has an excellent appetite; a hearty relish for food, drink, &c.: enjoys them much; is a good liver; not dainty: p. 86. c. 5. 12. 14.
VERY LARGE, sets too much by the indulgence of his palate; eats with the keenest appetite; perhaps "makes a god of his belly:" p. 87. c. 18.
MODERATE, has not a good, nor very poor, but *rather* poor, appetite: p. 87.
SMALL OR VERY SMALL, is dainty, mincing, particular about food; eats with little relish; hardly cares when he eats, or whether at all: p. 88.

9. 8. ACQUISITIVENESS.—*Love of acquiring and possessing* PROPERTY AS SUCH; *desire to save, lay up, &c.; innate feeling of* MINE AND THINE, *of a right to possess and dispose of things:* p. 89.
AVERAGE, loves money, but not greatly; can make it, but spends freely.
FULL, sets by property, both for itself, and what it procures, yet is not penurious; is industrious and saving, yet supplies his wants: p. 93.
LARGE, has a strong desire to acquire property; is frugal; saving of money; close and particular in his dealings; devoted to money-making, trading, &c.; generally gets the value of his money: p. 89. c. 5. 18.
VERY LARGE, makes money his *idol;* grudges it; is tempted to get it dishonestly; penurious; sordid; covetous; &c.: p. 92. c. 8. 9. 20. 26.
3 MODERATE, finds it more difficult to *keep* than make money; desires it more to supply wants than lay up; is hardly saving enough: p. 94. c. 7. 14.
SMALL, will generally spend what money he can get injudiciously, if not profusely; lays up little; disregards the prices of things: p. 95. c. 27. 41.
VERY SMALL, cannot know nor be taught the value or use of money: p. 95.

10. 7. SECRETIVENESS.—*Desire and ability to secrete, conceal, &c.*
AVERAGE, is not artful nor very frank; is generally open; *can* conceal.
FULL, can keep to himself what he wishes to, yet is not cunning: p. 99.
LARGE, seldom discloses his plans, opinions, &c.; is hard to be found out; reserved; non-committal: p. 96. c. 5. 40.
VERY LARGE, seldom appears what he is, or says what he means; often equivocates and deceives; is mysterious, dark, cunning, artful, given to double-dealing, eye-service, &c.: p. 98. c. 8. 9. 12. 13. 15. 16. 17, 20. 25. 26. 22. 30. 31. 33. 34. 36. 37. 38.
+3 MODERATE, is quite candid and open-hearted; loves truth; dislikes concealment, underhand measures, &c.; seldom employs them: p. 100.
SMALL, speaks out just what he thinks; acts as he feels; does not wish to learn or tell the secrets of others, yet freely tells his own; is *too* plain-spoken and candid: p. 101. c. 21. 27. 41.
VERY SMALL, keeps nothing back; has a transparent heart: p. 101.

GENUS III. HUMAN, MORAL, AND RELIGIOUS SENTIMENTS: 102.

SPECIES I. SELFISH SENTIMENTS. In their character and objects, these faculties partake more of the *human*, and less of the *animal*, than do the selfish *propensities*, and although they terminate upon *self*, yet they hav no inconsiderable influence upon the *moral* character: p. 47. 103. c. 2
AVERAGE OR FULL, has a respectable, though not great, regard for hi *character*, and desire to do something worthy of *himself:* c. 21. 10. 11
6 LARGE OR VERY LARGE, thinks much of and about himself; has a grea amount of *character* of some kind: p. 51. c. 5. 6. 12. 14. 15. 16. 18. 40.
MODERATE, SMALL, OR VERY SMALL, has too little pride and weight of character and ambition to give manliness and efficiency: c. 20. 26.

1. 10. CAUTIOUSNESS.—*Carefulness; provision against danger.*
AVERAGE, has some caution, yet hardly enough for success: c. 41.
+5 FULL, has prudence and forethought, yet not too much: p. 105. c. 40

LARGE, is always watchful; on the look-out; careful; anxious; solicitous; provident against real and imaginary danger, &c.: p. 104. c. 5. 6. 15.
VERY LARGE, hesitates too much; suffers greatly from *groundless* fears; is timid, easily frightened, &c.: p. 105. c. 12. 13. 16. 17. 21. 26. 27. 31.
MODERATE, is rather imprudent, hence unlucky; liable to misfortunes caused by carelessness; plans too imperfectly for action: p. 106.
SMALL, acts impromptu; disregards consequences; fears nothing; is imprudent; luckless; often in hot water: p. 106.
VERY SMALL, is reckless, destitute of fear and forethought: p. 107.

CIRCUMSPECTION. *Propriety; discreetness of expression and conduct.*
AVERAGE OR FULL, has some, though none too much, discretion and propriety of expression and conduct; sometimes speaks inconsiderately.
LARGE OR VERY LARGE, weighs well what he says and does; has a nice sense of propriety; thinks twice before he speaks once.
MODERATE OR SMALL, does and says indiscreet things: unascertained.

12. 11. APPROBATIVENESS.—*Sense of honour, regard for character; ambition; love of popularity, fame, distinction, &c.:* p. 107.
AVERAGE, enjoys approbation, yet will not *sacrifice* much to obtain it.
+3. FULL, desires and seeks popularity, and feels censure, yet will neither deny nor trouble himself much to secure or avoid either: p. 110.
LARGE, sets every thing by *character, honour*, &c.; is keenly alive to the frowns and smiles of publick opinion, praise, &c.; tries to show off to good advantage; is affable, ambitious, apt to praise himself: p. 108.
VERY LARGE, regards his *honour* and *character* as the *apple of his eye;* is even *morbidly* sensitive to praise and censure; over fond of show, fashion, praise, style, &c.; *extremely* polite, ceremonious, &c.: p. 110.
MODERATE, feels reproach some, yet is little affected by popularity or unpopularity; may gather the flowers of applause that are strewed in his path, yet will not deviate from it to collect them: p. 112.
SMALL, cares little for popular frowns or favours; feels little shame; disregards and despises fashions, etiquette, &c.; is not polite: p. 112.
VERY SMALL, cares nothing for popular favour or censure.

13. 12. SELF-ESTEEM. *Self-respect; high-toned, manly feeling; innate love of personal liberty, independent, &c.; pride of character:* p. 113.
AVERAGE, respects himself, yet is not haughty: c. 21. 41.
FULL, has much self-respect; pride of character; independence: p. 116.
+6 LARGE, is high-minded, independent, self-confident, dignified, his own master; aspires to *be* and *do* something worthy of himself; assumes responsibilities; does few *little* things: p. 114. c. 5. 6.
VERY LARGE, has unbounded self-confidence; endures no restraint; takes no advice; is rather haughty, imperious, &c.; p. 116. c. 8. 14. 15. 16.
MODERATE, has some self-respect, and manly feeling, yet too little to give ease, dignity, *weight* of character, &c.; is too trifling: p. 116. c. 26
SMALL, lets himself down; says and does *trifling* things; associates with inferiors; is not looked up to; lacks independence: p. 117. c. 11.
VERY SMALL, is servile, low-minded: destitute of self-respect: p. 117.

14. 15. FIRMNESS.—*Decision, stability, fixedness of character, &c.* 119.
AVERAGE, has some decision, yet too little for general success: c. 10. 20
FULL, has perseverance enough for ordinary occasions, yet too little for *great* enterprises; is neither fickle nor stubborn: p. 121. c. 21. 27.
+6 LARGE, may be fully relied on; is set in his own way; hard to be convinced or changed at all; holds on long and hard: p. 119. c. 6.

VERY LARGE, is wilful; and so tenacious and unchangeable of opinion, purpose, &c., that he seldom gives up any thing: p. 120. c. 5. 8. 12. 14. 15. 16. 17.

MODERATE, gives over too soon; changes too often and too easily; thus fails to effect what greater firmness would do: p. 122. c. 11. 26.

SMALL OR VERY SMALL, lacks perseverance; is too changeable and vacillating to effect much, or be relied upon: p. 122.

SPECIES II. MORAL AND RELIGIOUS SENTIMENTS. These render man a moral, accountable, and religious being; humanize, adorn, and elevate his nature; connect him with the *moral* government of God, create the higher and nobler sentiments of our nature; and are the origin of goodness, virtue, moral principle and purity, &c.: p. 48. 123. c. 2.

5. AVERAGE OR FULL, has moral feeling and principle, yet too little to withstand large or very large propensities: c. 8. 15. 21.

LARGE OR VERY LARGE, is morally inclined; sentimental; thinks and feels much on moral and religious subjects, &c.: p. 52. c. 5. 6. 7. 11. 41.

MODERATE, SMALL, OR VERY SMALL, has not strong moral or religious feelings; lets his larger faculties rule him: p. 52. c. 14. 17. 20. 26. 42.

15. 16. CONSCIENTIOUSNESS.—*Innate feeling of duty, accountability, justice, right, &c.; moral principle; love of truth:* p. 124.

AVERAGE, has right intentions, but their influence is limited: c. 15.

FULL, strives to do right, yet sometimes yields to temptation; resists besetting sins, but may be overcome, and then feels remorse: p. 130. c. 27.

6 LARGE, is honest; faithful; upright at heart; moral in feeling; grateful; penitent; *means* well; consults *duty* before expediency; loves and means to speak the truth; cannot tolerate wrong: p. 126. c. 13. 25. 11.

× 8 7 VERY LARGE, is *scrupulously* exact in matters of right; perfectly honest in motive; always condemning self and repenting; very forgiving, conscientious, &c.; makes *duty* every thing, expediency nothing: p. 129.

MODERATE, has considerable regard for duty *in feeling*, but less in practice; justifies himself; is not very penitent, grateful, or forgiving; often temporizes with principle; sometimes lets *interest* rule *duty:* p. 131.

SMALL, has few conscientious scruples; little penitence, gratitude, regard for moral principle, justice, duty, &c.: p. 132. c. 20. 16. 17. 42.

VERY SMALL, neither regards nor *feels* the claims of duty or justice.

16. 17. HOPE.—*Anticipation; expectation of future happiness, success, &c.*

AVERAGE, has some, but generally reasonable, hopes; is seldom elated.

FULL, is quite sanguine, yet realizes about what he expects: p. 139.

+ 6 LARGE, expects, attempts, and promises a great deal; is generally sanguine, cheerful, &c.; rises above present troubles; though disappointed, hopes on still; views the brightest side of prospects: p. 137. c. 5. 6. 26.

VERY LARGE, has unbounded hopes; builds a world of castles in the air; lives in the future; has too many irons in the fire: p. 138. c. 12. 13.

MODERATE, expects and attempts too little; succeeds beyond his hopes; is prone to despond; looks on the darker side: p. 139.

SMALL, is low-spirited; easily discouraged; fears the worst; sees many lions in his way; magnifies evils; lacks enterprise: p. 140. c. 17.

VERY SMALL, expects nothing good; has no hope of the future: p. 140.

17. 18. MARVELLOUSNESS.—*Belief in the supernatural; credulity.*

AVERAGE, believes some, but not much, in wonders, forewarnings, &c.

FULL, is open to conviction; rather credulous; believes in dreams, divine providences and forewarnings, the wonderful, &c.: p. 143.
LARGE, believes and delights in the supernatural, in dreams, ghosts, &c.; thinks many natural things supernatural: p. 142. c. 8. 12.
VERY LARGE, is very superstitious; regards most things with wonder.
MODERATE, believes but little that cannot be accounted for, yet is open to conviction; is incredulous, but listens to evidence: p. 144.
+2 SMALL, is convinced only by the hardest; believes nothing till he sees *facts*, or *why and wherefore*, not even revelation farther than a *reason* is rendered; is prone to reject new things without examination: p. 145.
VERY SMALL, is skeptical; believes little else than his senses: p. 146.

18. 14. VENERATION.—*The feeling of worship for a Supreme Being; respect for religion and things sacred, and for superiors:* p. 147.
AVERAGE, may feel *religious* worship, yet little respect for *men*. 10.
5 FULL, is capable of much religious fervour and devotion, yet is not *habitually* serious; generally treats his fellow men civilly: p. 149. c. 11. 42.
LARGE, loves to adore and worship God, especially through his works; treats equals with respect, and superiors with deference: p. 148. c. 6.
VERY LARGE, is eminent, if not pre-eminent, for piety, heart-felt devotion, religious fervour, seriousness, love of divine things, &c.: p. 149. c. 5. 12. 15. 16. 26. 41.
MODERATE, disregards religious creeds, forms of worship, &c.; places religion in other things; is not serious nor respectful: p. 150. c. 21.
SMALL, feels little religious worship, reverence, respect, &c.: p. 150
VERY SMALL, seldom, if ever, adores God; is almost incapable of it.

19. 13. BENEVOLENCE. *Desire to see and make sentient beings happy; willingness to sacrifice for this end; kindness; sympathy for distress.*
AVERAGE, has kind, fellow feeling, without much *active* benevolence.
FULL, has a fair share of sympathetick *feeling*, and some, though no great, willingness to sacrifice for others: p. 158.
6 LARGE, is kind, obliging, glad to serve others, even to his injury; feels lively sympathy for distress; does good to all: p. 155. c. 6. 7. 18. 21.
VERY LARGE, does all the good in his power; gladly sacrifices self upon the altar of pure benevolence; scatters happiness wherever he goes; is one of the kindest-hearted of persons: p. 157. c. 5. 10. 11. 40. 41.
MODERATE, has some benevolent feeling, yet too little to prompt to much self-denial; does good only when he can without cost: p. 158. c. 12. 20.
SMALL, feels little kindness or sympathy; is almost deaf to the cries of distress; hard-hearted, selfish, &c.: p. 159. c. 8. 14. 15. 26. 42.
VERY SMALL, is destitute of all humanity and sympathy: p. 159. c. 24.

SPECIES III. SEMI-INTELLECTUAL SENTIMENTS. By creating a taste for the arts, improvements, polite literature, the refinements and elegancies of life, &c., these faculties greatly augment human happiness, and adorn and elevate human nature: p. 48. 159. c. 2. Large in c. 6. 11. 18.

20. 9. CONSTRUCTIVENESS. *Mechanical dexterity and ingenuity; desire and ability to use tools, build, invent, employ machinery, &c.*
AVERAGE, has some, yet no great, relish for, and tact in, using tools.
FULL, has fair mechanical ingenuity, yet no great *natural* talent or desire to make things; with practice, will do well; without it, little: p. 163.
6 LARGE, shows great *natural* dexterity in using tools, executing mechanical operations, working machinery, &c.; loves them: p. 161. c. 18

7. VERY LARGE, is a *mechanick* of the first order; a true *genius;* loves it too well to leave it; shows extraordinary skill in it: p. 162. c. 7. 19.
MODERATE, with much practice, may use tools quite well, yet dislikes mechanical operations; owes more to art than nature: p. 163. c. 14.
SMALL, hates and is awkward and bungling in using tools, &c.: p. 163.
VERY SMALL, has no mechanical skill or desire: p. 164.

21. 19. IDEALITY.—*Imagination; taste; fancy; love of perfection, poetry, polite literature, oratory, the beautiful in nature and art, &c.*
AVERAGE, has some taste, though not enough to influence him much.
FULL, has refinement of feeling, expression, &c., without sickly delicacy; some love of poetry, yet not a vivid imagination: p. 168. c. 6. 7. 42.
6. LARGE, has a lively imagination; great love of poetry, eloquence, fiction, good style, the beauties of nature and art: p. 166. c. 11. 18. 41.
VERY LARGE, often gives reins to his erratick imagination; experiences revellings of fancy, ecstasy, rapture of feeling, enthusiasm: p. 167. c. 40.
MODERATE, has some, but not much, imagination; is rather plain in expression, manners, feeling, &c.; dislikes poetry, finery, &c.: p. 168. 42.
SMALL, lacks taste, niceness, refinement, delicacy of feeling, &c.: p. 169.
VERY SMALL, is destitute of the qualities ascribed to this faculty: p. 169.

B. SUBLIMITY.—*Conception of grandeur; sublime emotions excited by contemplating the vast, magnificent, or splendid in nature or art.*
AVERAGE, sometimes, but not to a great degree, experiences this feeling.
5. FULL, enjoys magnificent scenes well, yet not remarkably so.
LARGE, admires and enjoys mountain scenery, thunder, lightning, tempest, a vast prospect, &c., exceedingly; hence, enjoys travelling: p. 249.
VERY LARGE, is a passionate admirer of the wild and romantick; feels the sublimest emotions whilst contemplating the grand or awful in nature; dashing, foaming, roaring cataracts, towering mountains, peals of thunder, flashes of lightning, commotions of the elements, the starry canopy of heaven, &c.: p. 249. c. 11. 40. 41.
MODERATE, has some, though not at all vivid, emotions of this kind.
SMALL, OR VERY SMALL, discovers little in nature to awaken this feeling.

22. 21. IMITATION.—*Disposition and ability to take pattern, imitate*
AVERAGE, copies some, yet too little to deserve or excite notice.
FULL, with effort, copies some, but not well; cannot *mimick:* p. 171
LARGE, has a great propensity and ability to copy, take pattern from others, do what he sees done, &c.; needs but one showing; gesticulates much; describes and acts out well: p. 170. c. 41.
VERY LARGE, can mimick, act out, and copy almost any thing; describe, relate anecdotes, &c., to the very life; has a theatrical taste and talent; seldom speaks without gesturing: p. 171. c. 11. 40.
3. MODERATE, cannot mimick at all; can copy, draw, take pattern, &c., only with difficulty; describes, relates anecdote, &c., poorly: p. 171.
SMALL, dislikes and fails to copy, draw, do after others, &c.: p. 172
VERY SMALL, has little ability to imitate or copy any thing: p. 172.

23. 20. MIRTHFULNESS.—*Intuitive perception of the absurd and ridiculous; a joking, fun-making, ridiculing disposition and ability.*
AVERAGE, perceives jokes, and relishes fun, but cannot *make* much.
FULL, has much mirthful feeling; makes and relishes jokes well: p. 175.
6. LARGE, has a quick, keen perception of the ludicrous; makes a great amount of fun; too much for his own good; is quick at repartee; smiles often; laughs heartily at jokes: p. 173. c. 11. 18.

VERY LARGE, is quick and apt at turning every thing into ridicule, throws off constant sallies of wit; is too facetious, jocose, &c.: p. 175. c. 6.
MODERATE, has some witty ideas, yet lacks quickness in conceiving, and tact in expressing them; is generally quite sober: p. 176. c. 26.
SMALL, makes little fun; is slow to perceive, and still slower to turn jokes; seldom laughs; thinks it wrong to do so: p. 177.
VERY SMALL, has few if any witty ideas or conceptions: p. 177.

GENUS III. INTELLECTUAL FACULTIES. These have to do with the *physical* and the *metaphysical* world; with *things* in general, and their *qualities, relations*, &c.; with the world and its contents: p. 49. 177. c. 2.

5. AVERAGE OR FULL, has sufficient intellect to get along in the world, yet not enough to render him eminent for talents: c. 10. 15. 21. 27.

to 6. LARGE, is possessed of sufficient *natural* talent and *power* of intellect to enable him to take a high intellectual stand among men, yet their direction depends upon other causes: c. 18.
VERY LARGE, is by nature a truly *great* man; possesses the highest order of natural talents; is capable of rising to *pre-eminence*: c. 5. 6. 7. 11. 40. 41.
MODERATE OR SMALL, shows little talent, lacks sense: c. 8. 14. 20. 42.

SPECIES I. THE SENSES; *sensation, sight, hearing, taste, smell.* 178.

SPECIES II.—OBSERVING AND KNOWING FACULTIES. These bring man into direct intercourse with the *physical* world; observe *facts* of all kinds, that is, the *conditions, qualities, phenomena*, and *physical* relations of *material* things: collect and treasure up information; create the desire to see and know things, &c.: p. 50. 183. c. 2.

4. AVERAGE OR FULL, possesses fair perceptive powers: c. 6. 10. 11. 21.
LARGE, with advantages, knows a great deal about matters and things in general; is very quick of observation and perception; has a practical, matter-of-fact, common sense tact and talent; can show off to excellent advantage; appear to know all that he really does, and perhaps more; is capable of becoming an excellent scholar, or of acquiring and retaining knowledge with great facility, and attending to the *details* of business; and has a decidedly *practical* intellect: p. 50. c. 15. 16. 17. 18. 19. 25.
VERY LARGE, is *pre-eminent* for the qualities just described; seizes as if by intuition upon the properties, conditions, fitness or unfitness, value, &c., of things; has wonderful powers of observation and ability to acquire knowledge; has a natural taste and talent for examining and collecting statistics, studying natural science, &c.: p. 53. c. 5. 7. 12. 40.
MODERATE OR SMALL, is rather slow of observation and perception, cannot show to be what he is; acquires knowledge with difficulty, is slow in learning and doing things off-hand, &c.: p. 53.

24. 22. INDIVIDUALITY.—*Observing and individualizing power and desire; curiosity to see and know; disposition to specify, personify.*
AVERAGE, has some, yet no great, curiosity, and desire to see things.

5. FULL, has fair observing powers, and desire to see things: p. 185. c. 6. 21.
LARGE, has a *great* desire to know, investigate, examine, experience, &c.; is a great observer of men and things; quick of perception; sees what is transpiring, what should be done, &c.: p. 184. c. 8. 10. 11. 14. 25.
VERY LARGE, has an *insatiable* desire to see and know *every thing*; *extraordinary* observing powers; is eager to witness every passing [illegible]: p. 185. c. 5. 7. 12. 13. 15 22. 23. 40. 41. 42.

MODERATE, is rather deficient, yet not palpably so, in observing power and desire; not sufficiently specifick: p. 185.
SMALL, is slow to see things; attends little to particulars: p. 186.
VERY SMALL, sees scarcely any thing; regards things in the gross: p. 186

25. 23. FORM.—*Cognizance and recollection of shape, or configuration*
AVERAGE, recollects forms, faces, &c., quite well, but not very well.
FULL, recognises persons, countenances, &c., well: p. 188. c. 9. 19.
6. LARGE, notices, and for a long time remembers, the faces, countenances, forms, looks, &c., of persons, beasts, things, &c., once seen; knows by sight many whom he may be unable to name: p. 187. c. 6. 18. 40. 26
VERY LARGE, never forgets the countenance, form, &c., of persons and things seen; easily learns to read and spell correctly; reads and sees things at a great distance; has excellent eyesight: p. 188. c. 5. 7. 13. 17. 23. 39.
MODERATE, must see persons several times before he can recollect them; sometimes doubts whether he has seen certain persons: p. 189.
SMALL OR VERY SMALL, has a miserable memory of persons, looks, shape, &c.; fails to recognise even those he sees often: p. 189.

26. SIZE.—*Cognizance and knowledge of relative magnitude, bulk, &c.*
AVERAGE, measures bulk with tolerable, but not great, accuracy: c. 21. 27
4. FULL, can measure ordinary and familiar distances well, yet shows no remarkable *natural* talent in it: p. 191. c. 6. 8. 9. 10. 14. 18.
LARGE, has an excellent eye for measuring proportion, size, height, angles, perpendiculars, &c.; quickly detects disproportions in them: p. 190. c. 11. 19. 25. 42.
VERY LARGE, detects disproportion, and judges of size, with wonderful accuracy, by intuition, and as well without as with instruments; cannot endure inaccuracy: p. 191. c. 5. 7. 12. 13. 15. 16. 17. 40.
MODERATE, is rather deficient in measuring by the eye; with practice, may do tolerably well in short, but fails in long, distances: p. 191.
SMALL, judges of relative size, &c., very inaccurately: p. 191. c. 28. 29.
VERY SMALL, can hardly distinguish mountains from molehills: p. 192.

27. WEIGHT.—*Intuitive perception and application of the principles of specifick gravity, projectile forces, momentum, balancing, resistance.*
4 AVERAGE, balances himself tolerably well in ordinary cases, yet has no great natural talent in this respect: c. 21. 27.
FULL, keeps his centre of gravity well, but ventures little: p. 194.
LARGE, can walk on a high or narrow place; hold a steady hand; throw a stone or ball, and shoot, straight; ride a fractious horse, &c., very well: p. 193. c. 16. 17. 25. 26. 40. 41.
VERY LARGE, has this power to a wonderful extent: p. 194. c. 7. 13. 15.
MODERATE, maintains his centre of gravity, &c., rather poorly: p. 194.
SMALL OR VERY SMALL, is unlike one with weight large: p. 195. c. 20.

28. 26. COLOUR.—*Perception and recollection of colours, hues, tints, &c.*
AVERAGE, can discern and recollect colours, yet seldom notices them.
FULL, with practice, compares and judges of colours well; without it, does not excel: p. 196. c. 10. 11. 41.
LARGE, has a natural taste and talent for comparing, arranging, mingling, applying, and recollecting colours; is delighted with paintings: p. 195.
VERY LARGE, resembles one with colour large, but *excels* him: p. 196.
3. MODERATE, aided by practice, can discern and compare colours, yet owes less to nature than art; seldom notices colours unless obliged to, and then soon forgets them: p. 197 c 20

SMALL, seldom observes the colour of one's hair, eyes, dress, &c.; can not describe them by what they wear, or compare colours apart; hardly distinguishes the primary colours by candlelight, much less shades: p. 197.
VERY SMALL, can tell white from black, but do little more: p. 197. c. 19.

29. 28. ORDER. *System; physical arrangement; a place for things.*
AVERAGE, appreciates order, yet not enough to keep it: c. 9. 10. 27.
5. FULL, likes order; takes much pains to keep things arranged: p. 200.
LARGE, has a place for things, and things in their places; can find, even in the dark, what *he alone* uses; is systematick; annoyed by disorder: p. 199. c. 6. 11. 15. 19. 40. 41.
VERY LARGE, is very precise and particular to have every *little* thing in its place; literally tormented by disorder; is fastidious: p. 199. c. 5. 7
MODERATE, likes, but does not keep order; allows confusion: p. 201.
SMALL OR VERY SMALL, is nearly destitute of order and system: p. 201

30. 29. CALCULATION.—*Intuitive perception of the relations of numbers; ability to reckon figures in the head; numerical computation.*
4. AVERAGE, by practice and rules, may reckon figures quite well: c. 10.
FULL, aided by rules and practice, may excel in reckoning figures, and do well in his head, but not without them: p. 204. c. 11. 27.
LARGE, can add, subtract, divide, &c., in his head, with facility and correctness; become a rapid, correct accountant; delights and excels in arithmetick: p. 202. c. 5. 13. 15. 19.
VERY LARGE, has an intuitive faculty, to a wonderful extent, of reckoning even complicated sums of figures in his head; delights in it: p. 203. c. 7.
MODERATE, does sums in his head rather slowly and inaccurately: p. 204.
SMALL, is dull and incorrect in adding, dividing, &c.; dislikes it: p. 205.
VERY SMALL, can hardly count, much less go farther: p. 205. c. 28. 29.

31. 27. LOCALITY. *Cognizance and recollection of relative position, looks and geography of places, &c.; desire to travel, see the world, &c.:* p. 205.
4. AVERAGE, has a fair, though not excellent, recollection of places: c. 27.
FULL, remembers places well, yet is liable to lose himself in a city or forest; ordinarily shows no deficiency; seldom loses himself: p. 207. c. 8.
LARGE, recollects distinctly the looks of places, where he saw things, &c.; seldom loses himself, even in the dark; has a *strong* desire to travel, see places, &c.: p. 205. c. 20. 25. 26.
VERY LARGE, never forgets the looks, location, or geography of any place, or hardly thing, he has ever seen; is even passionately fond of travelling, scenery, geography, &c.: p. 206. c. 5. 7. 12. 13. 16. 17. 40.
MODERATE, recollects places rather poorly; sometimes gets lost: p. 207.
SMALL OR VERY SMALL, has little geographical or local knowledge or recollection; seldom observes where he goes, or finds his way back: p. 208.

SPECIES III. SEMI-PERCEPTIVE FACULTIES. These have to do with *action* or *phenomena*, and their *conditions*, and deal them out to the reasoning faculties: p. 50. 209. Large in c. 5. 7. 17; small in 6. 25.

32. 30. EVENTUALITY.—*Recollection of actions, phenomena, occurrences, what has taken place, circumstantial and historical facts:* p. 209.
AVERAGE, has neither a good nor bad memory of occurrences, &c.; c. 8.
5. FULL, recollects leading events, and interesting particulars, and has a good memory of occurrences, yet forgets less important *details:* p. 212.
LARGE, has a clear and retentive memory of historical facts, general news, what he has seen, heard, read, &c., even in *detail:* p. 210. c. 5. 10. 16.
VERY LARGE, never forgets any occurrence, even though it is trifling

has a craving *thirst* for information and experimen , literally devours books, newspapers, &c.; commands an astonishing amount of information; p. 211. c. 12. 13. 14. 20.

MODERATE, recollects generals, not details; is rather forgetful: p. 212. c. 6.

SMALL, has a treacherous, confused memory of occurrences: p. 213.

VERY SMALL, forgets almost every thing, generals as well as particulars.

33. 31. TIME.—*Cognizance and recollection of succession, the lapse of time, dates, how long ago things occurred, &c.:* p. 214.

AVERAGE, notices and remembers dates, times, &c., some, but not well.

FULL, recollects *about*, but not precisely, when things occurred: p. 216.

LARGE, tells dates, appointments, ages, time of day, &c., well: p. 215.

VERY LARGE, remembers, with wonderful accuracy, the *time* of occurrences; is always punctual; tells the time, day, &c., by intuition: p. 216.

3. MODERATE, has rather a poor idea of dates, the time *when*, &c.: p. 216.

SMALL, can seldom tell *when* things took place; is not punctual: p. 217.

VERY SMALL, is liable to forget even his *age*, much more other things.

34. 32. TUNE.—*Tone; sense of melody and musical harmony; ability to learn tunes and detect chord and discord by ear; propensity to sing.*

AVERAGE, likes music; with practice may perform tolerably well.

FULL, can learn tunes by ear well, yet needs help from notes: p. 220.

LARGE, easily catches tunes, and learns to sing and play on instruments by rote; delights greatly in singing; has a correct musical ear: p. 218.

VERY LARGE, learns tunes by hearing them sung once or twice; is literally *enchanted* by *good* musick; shows intuitive skill, and spends much time, in making it; sings from the *heart*, and with melting pathos. p. 219. c. 12.

MODERATE, aided by notes and practice, may sing, yet it will be mechanically; lacks that soul and feeling which reaches the heart: p. 220.

SMALL, learns to sing or play tunes either by note or rote with great difficulty; sings mechanically, and without emotion or effect: p. 221.

VERY SMALL, can hardly discern one tune or note from another: p. 221.

35. 33. LANGUAGE. *Power of expressing ideas, feelings, &c., by means of words, attaching meaning to signs, &c.; verbal memory; desire and ability to talk:* p. 222.

AVERAGE, can communicate his ideas tolerably well, yet finds some difficulty; uses common words; can write better than speak.

5 FULL, commands a fair share of words, yet uses familiar expressions; is neither fluent nor the reverse; when excited, expresses himself freely, yet not copiously: p. 227. c. 6.

to 6. LARGE, is a free, easy, ready, fluent talker and speaker; uses good language; commits easily; seldom hesitates for words: p. 224. c. 5. 7. 20

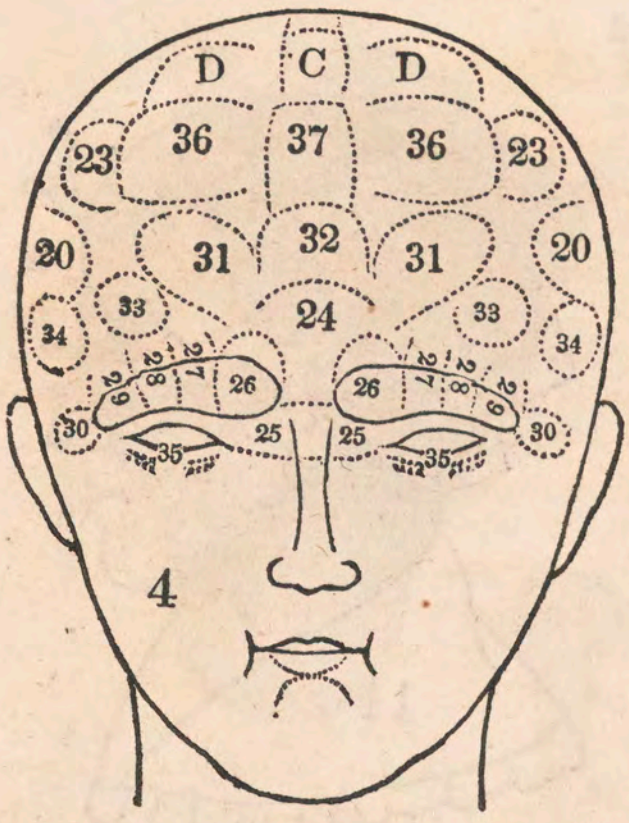
VERY LARGE, has by nature astonishing command of words, copiousness and eloquence of expression, and verbal memory; quotes with ease; is an incessant talker; has too many words: p. 226. c. 11. 40. 41.

MODERATE, often hesitates for words; employs too few; may *write* well, and be a critical *linguist*, but cannot be an easy, fluent *speaker:* p. 228.

SMALL, employs few words, and those common-place; in speaking, hesitates much; is barren in expression; commits slowly: p. 228.

VERY SMALL, can hardly remember or use words at all, or read: p. 229.

GENUS IV. REFLECTIVE OR REASONING INTELLECT. This looks beyond mere physical *facts* and natural *phenomena*, and investigates their *causes*, abstract relations, analogies, great *principles*. &c.: originates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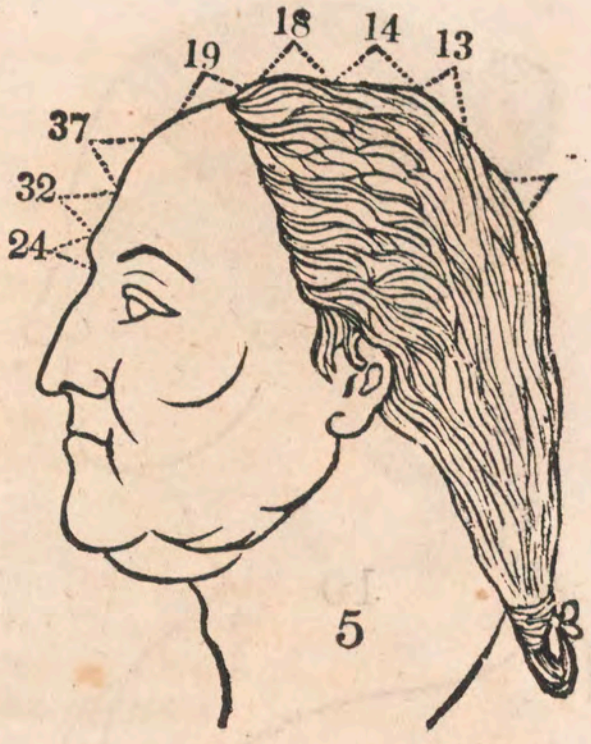
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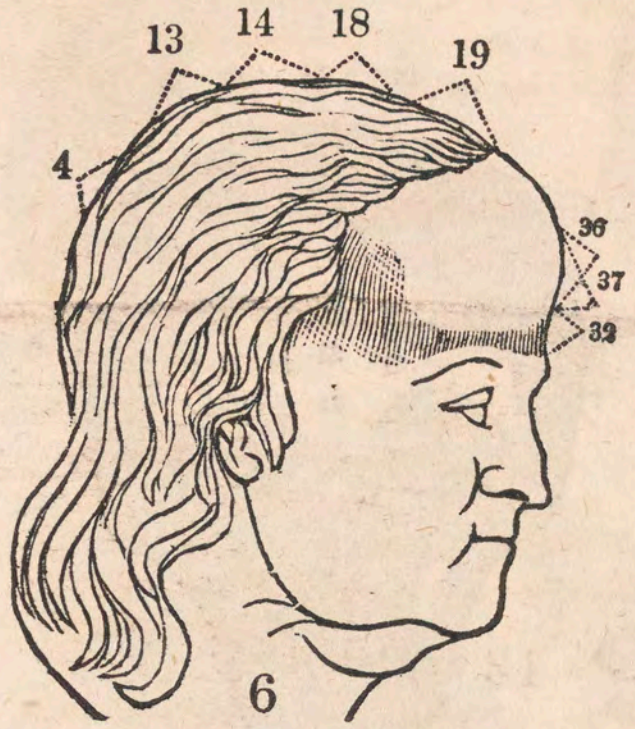
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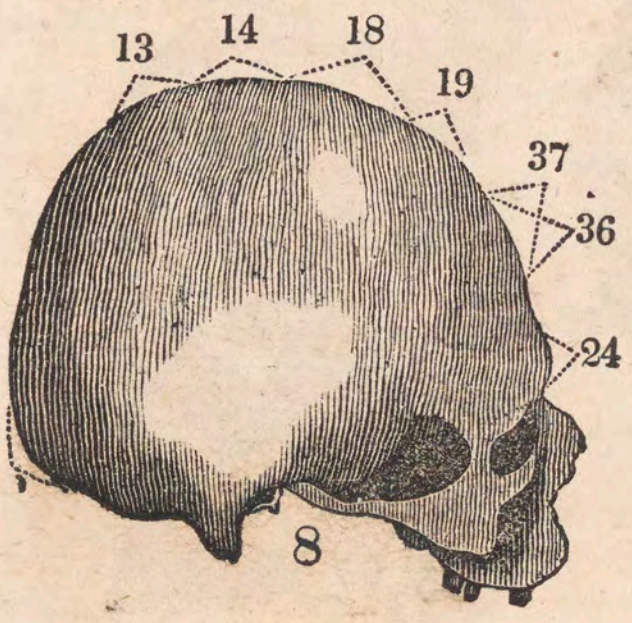
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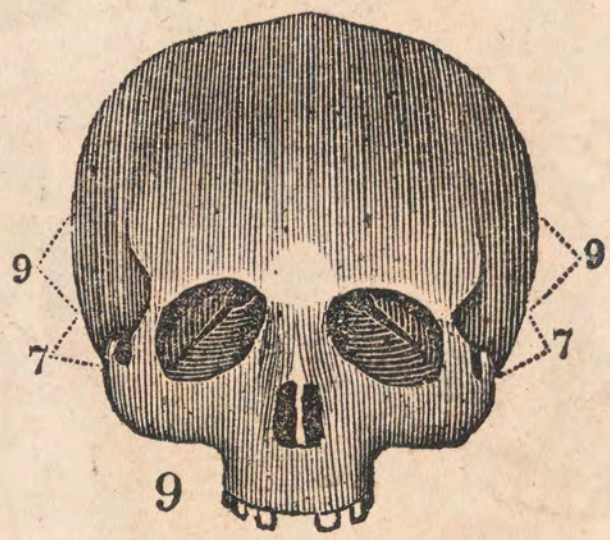
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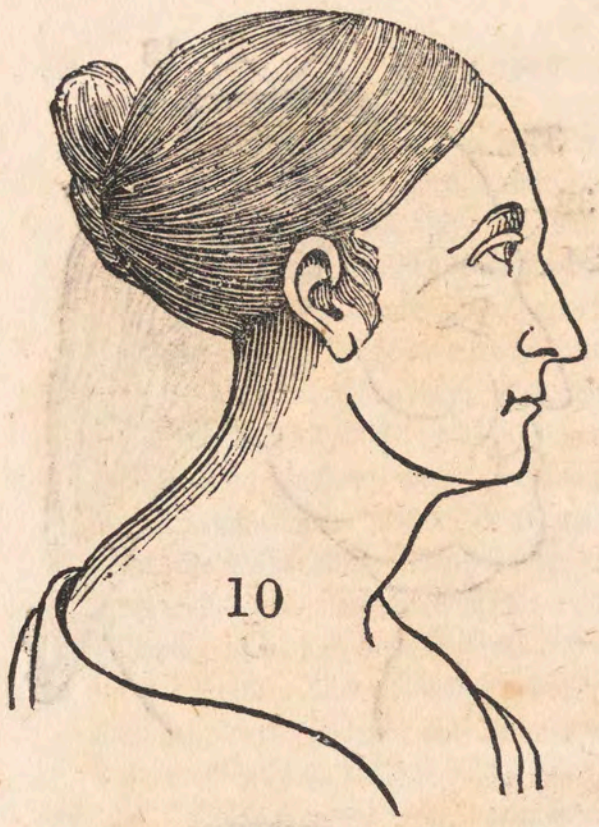
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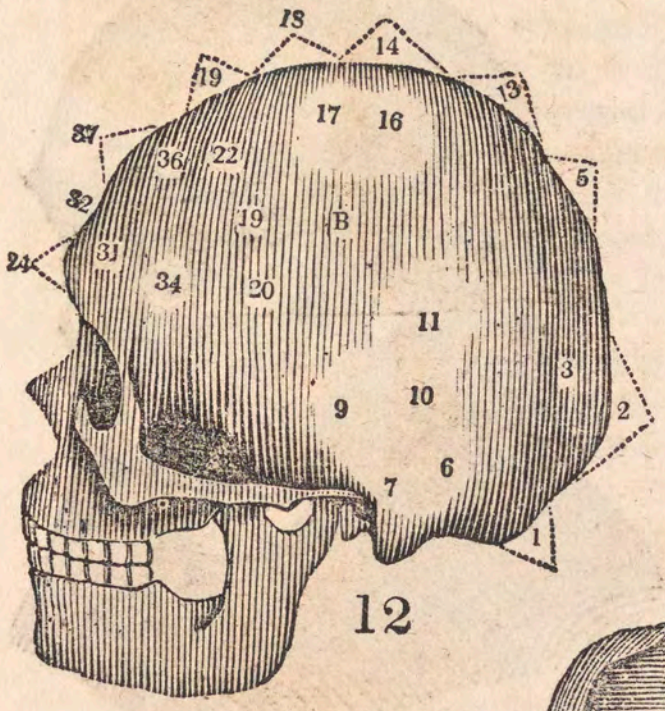
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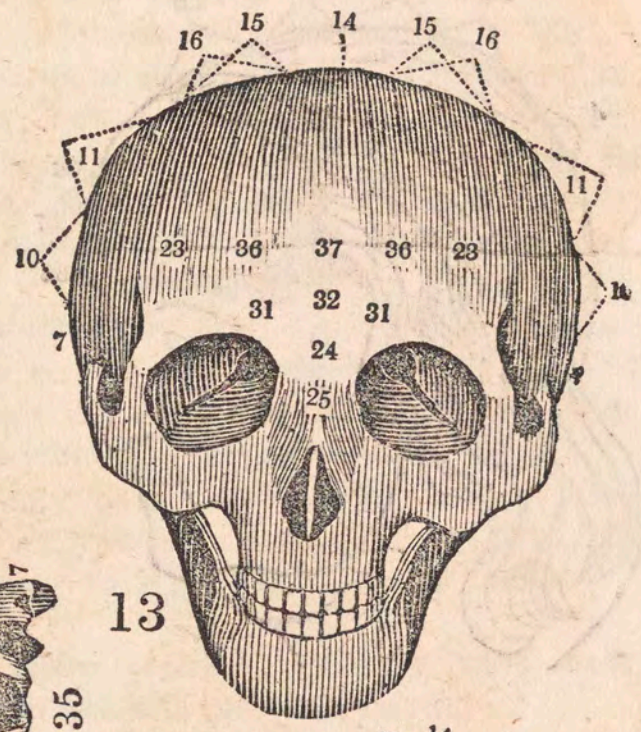
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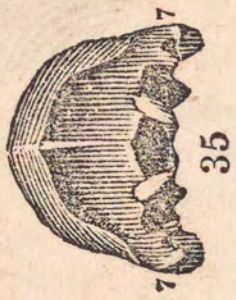
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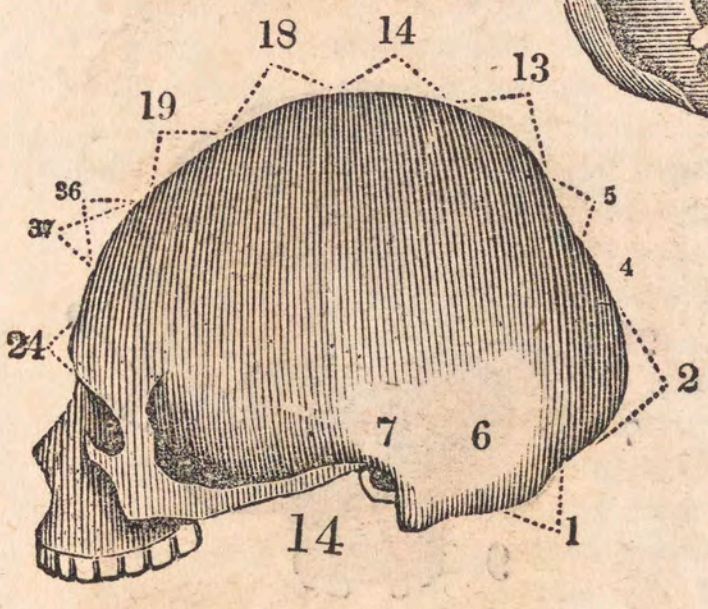
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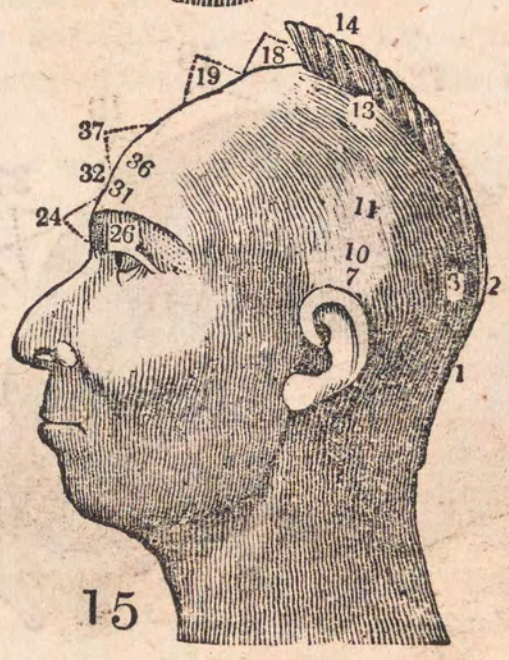
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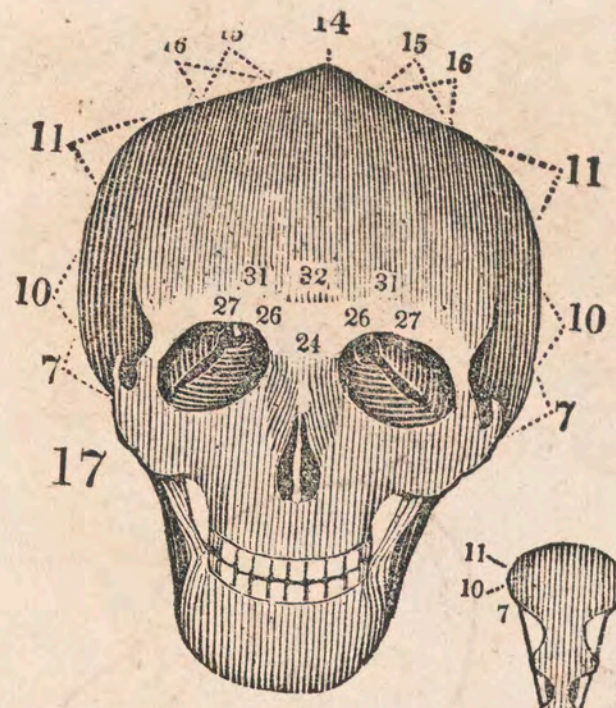
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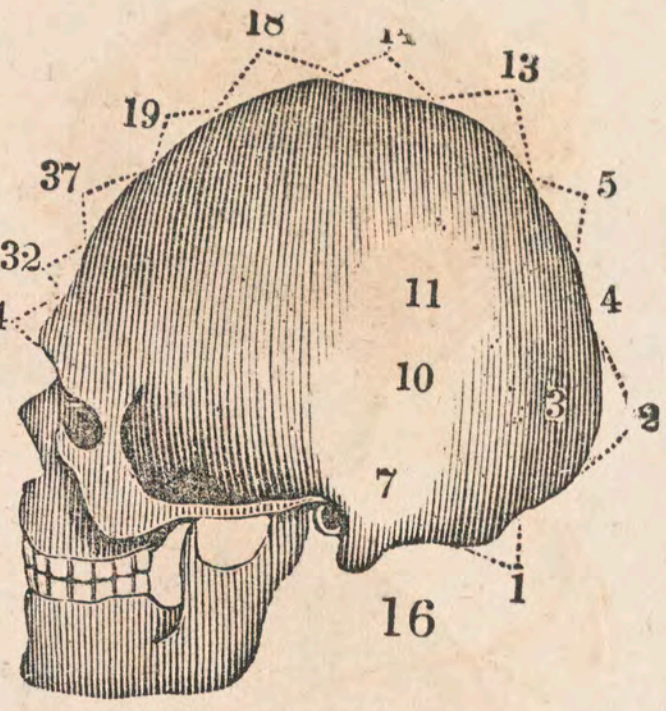
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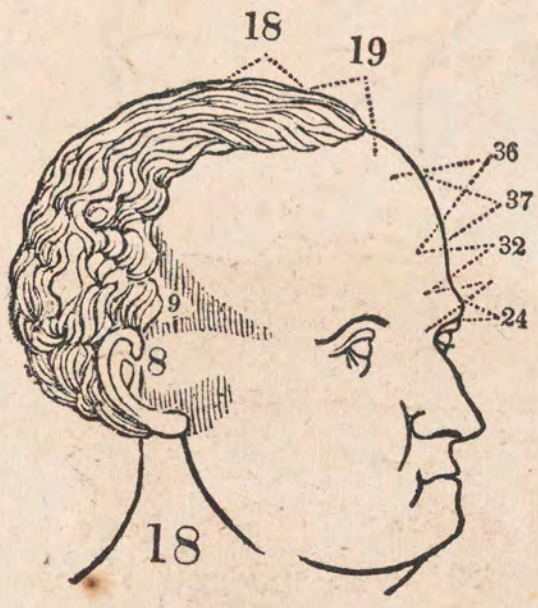
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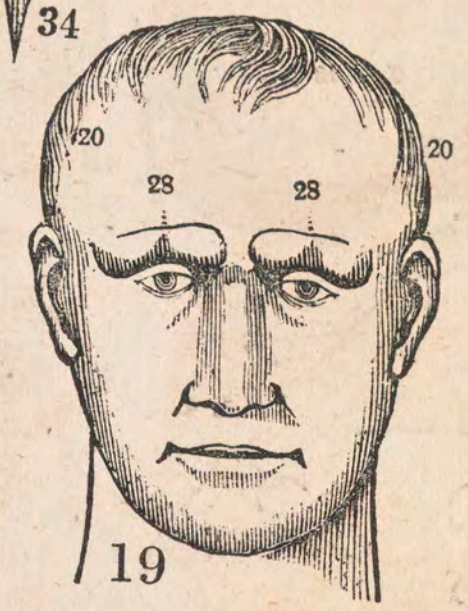
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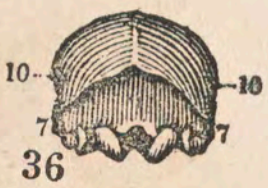
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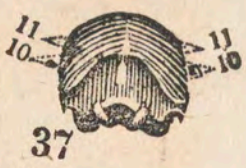
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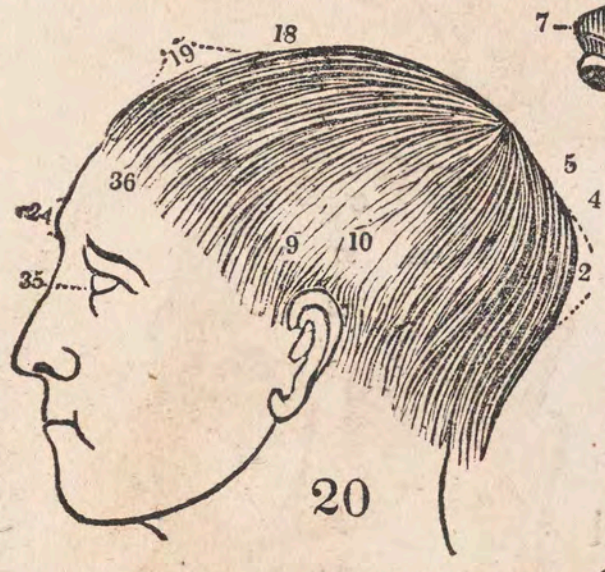
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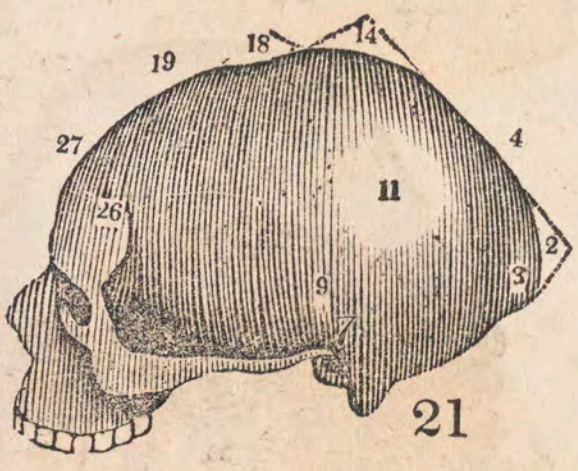
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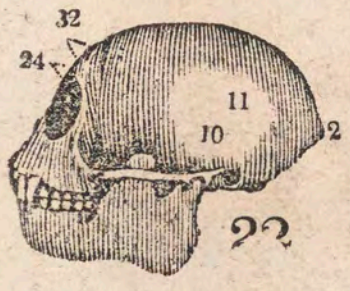
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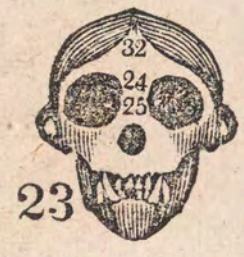
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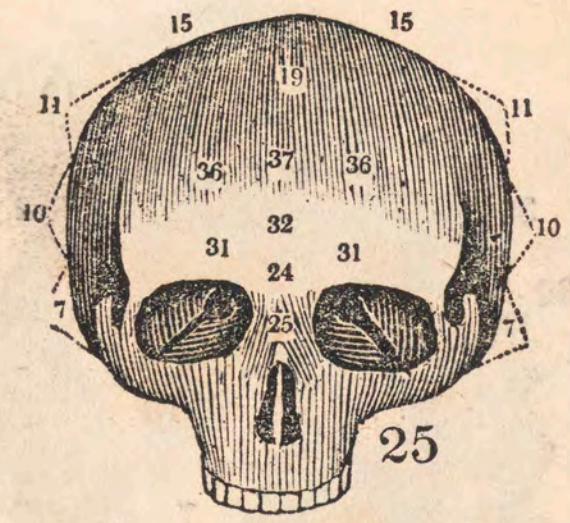

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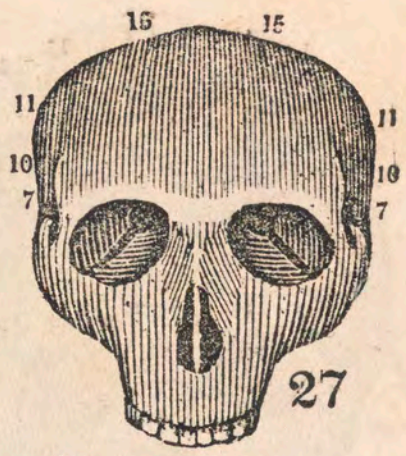

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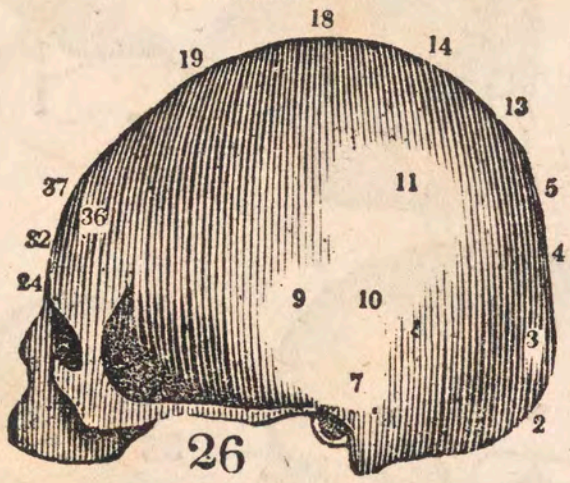

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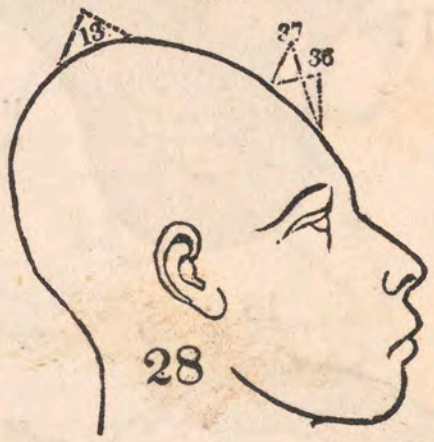

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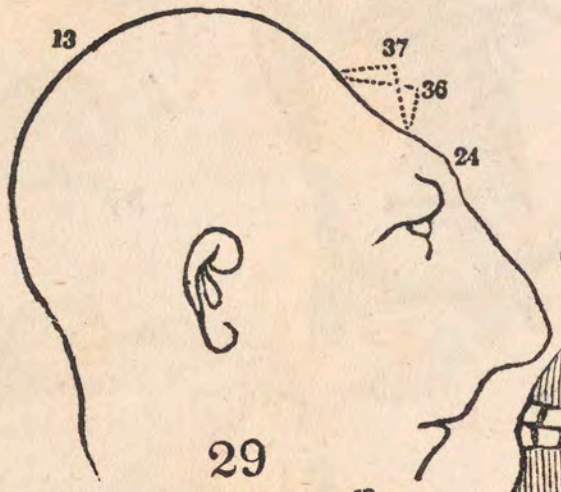

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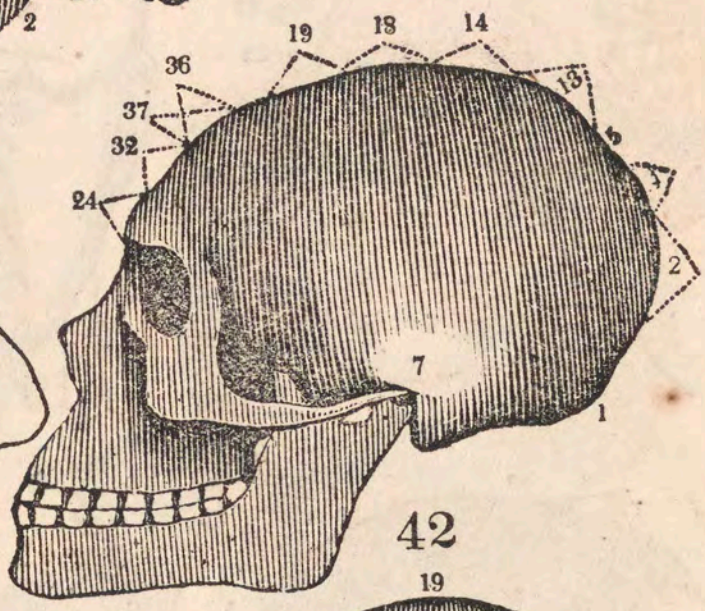

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THE MONTHLY ABSTRACT
OF
MEDICAL SCIENCE.

VOL. IV. No. 10. For List of Contents see last page. OCTOBER, 1877.

Anatomy and Physiology.

On Cerebral Localizations.

Dr. W. H. BROADBENT, Physician to St. Mary's Hospital, London, in a paper which he read at the recent International Medical Congress held at Geneva, presented the following conclusions :—

A.—*Motor Zone of the Superficial Cerebral Substance.*

1. The varied experiments of Hitzig, Ferrier, and other physiologists, have established the existence of a certain tract on the surface of the cerebral hemispheres which is in intimate relation with the nuclei of the motor nerves of the bulb and spinal marrow. In man and in the monkey, this zone is situated near the fissure of Rolando, chiefly in the two marginal convolutions which bound it. Here we find tracts more or less circumscribed, and specially connected with the leg, arm, face, etc.

2. The pathological phenomena of this zone coincide, in a remarkable manner, with the results of experimental physiology. Partial irritations may produce partial epilepsy, with or without hemiplegia, which is either fugitive or permanent. Deeper lesions attended by more or less complete destruction of the gray cortical substance may give rise to monoplegia or hemiplegia.

3. Admitting, however, the existence of a motor tract and motor centres on the surface of the brain, it is necessary to observe that no direct communication can exist between the cellules of this region and the cellules of the anterior gray cornua of the spinal marrow. The co-ordination and succession of movements produced by electricity; the kind of paralysis, its intermittence and short duration; the tendency of partial symptomatic epilepsy to commence in the hand, although different cerebral points may be affected; the lapse of time which occurs in the transmission of an electric stimulus; all these are reasons in favour of admitting that a ganglion must intervene between the cerebral surface and the roots of the motor nerves. From the cortico-motor centres descend our voluntary impulses; they are the source of ideo-motor actions. The cellules of the motor tract, which resemble those of the anterior cornua of the spinal marrow, constitute the apparatus whereby the dictates of our intelligence are formulated for expression or transmission to the world outside. The best example of a central cortico-motor function is that presented by the centre which presides over speech. It is the most important of all the cerebral localizations. Aphasia unaccompanied by paralysis of the lips and tongue is an example of what has been called a functional substitution, although the latter is incomplete.

4. The experiments of Ferrier and Hitzig tend to show the existence of a perceptive zone in the cortical layer of the brain. This zone extends from the curved fold which is the perceptive centre of vision along the sub-sylvian convolution of the temporo-sphenoidal lobe up to the termination of the latter. It then turns round near the unciform fold, towards the occipital lobe, where it probably constitutes the gyrus calcarinus. Pathology has not yet enabled us to clear up this point. We know, however, that complete destruction of the occipital lobe does not affect sensibility.

5. The frontal and occipital convolutions, those of the insula, of the inner surface of the hemispheres, and of the supra-orbital lobule remain insensible to

electric stimulation. Lesions of these portions of the cortical substance are not usually followed by any effect. Destruction of the two frontal lobes appears to diminish intellectual activity, while destruction of the occipital extremities of the hemispheres seems to annul the appetite; but such effects are not calculated to throw anything like a satisfactory light on the functions of these lobes.

6. The brain does not appear to possess any special vaso-motor centre. The vaso-motor apparatus is connected with the general vaso-motor system, and, like the latter, has centres in the spinal marrow, in the central ganglia, and in the convolutions. In like manner we have to note the absence of special trophical nerves or centres. The nutritive influence is a property common to the whole nervous system.

B.—*The Corpora Striata.*

1. The function of the corpus striatum is undoubtedly motor. The greater portion of the fibres proceeding from the extremity of the cerebral peduncle terminate in the striated body. Electrical excitement of this part gives rise to contraction of all the muscles on the opposite side. Hemiplegia ensues whenever it is destroyed by experiment or by disease. The corpus striatum would appear to act as an intermediate organ between the hemisphere and spinal marrow. Its cellules, grouped together and combined by sensori-motor practice, constitute an apparatus for the transmission of impulses from these cellules to the muscles.

2. The corpus striatum may be regarded as an intermediate ganglion, serving for the transmission of sensitive impressions from the nuclei of the sensitive nerves to the perceptive centres at the surface of the brain. This theory may give rise to several objections, but it is supported by the results of experiment and of pathological anatomy. Admitting as correct our theory concerning the localization of the nervous centres, it is anatomically impossible to discover any other mode of connection between the hemispheres than that afforded by the thalamus. The phenomena of hemianæsthesia are explained by this hypothesis in a very satisfactory manner. The corpus striatum, in this point of view, has a double action, and may serve at one and the same time as an instrument of the hemisphere, and as an automatic apparatus.

A general interpretation of symptoms derived from this theory may be arranged under the following heads:—

(*a*) Paralysis is a rupture of fibres or cellules presiding over the mechanism of the nervo-motor apparatus.

(*b*) Anæsthesia is a rupture of sensitive mechanism.

(*c*) Tremor is the effect of some impediment to the conducting power of the white fibres.

(*d*) Convulsions (including chorea) result from irritation of the gray substance.

(*e*) Premature and transient contracture is connected with pressure on a ganglion.

Under the point of view now stated, the nervous system is a vast mechanism composed of cellules and fibres; hence its functional action should be capable of being described in terms of "cellules and fibres." We would thus be enabled to avoid the ambiguities which have hitherto impeded the knowledge of cerebral physiology, and might hope to arrive at a correct theory of cerebral localizations.—*Medical Examiner*, July 26, 1877.

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On the Accumulation of White Blood-Corpuscles in the Cortical Portion of the Brain.

The Duke Charles of Bavaria, M.D., contributes an article on this subject to Virchow's *Archiv*, vol. lxix.

Popoff observed that in typhoid fever and in typhus there may be found in the brain white blood-corpuscles, not only in the neighbourhood of ganglion-cells, but even in their substance, in which case they might cause a division of the nuclei of those cells. These facts might be considered an anatomical base

THE MONTHLY ABSTRACT
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MEDICAL SCIENCE.

VOL. IV. No. 3. For List of Contents see last page. MARCH, 1877.

Anatomy and Physiology.

The Functions of the Cerebellum.

Professor NOTHNAGEL (*Virchow's Archiv*, Oct. 1876), in continuation of his papers on the function of the brain, publishes an account of his researches on the functions of the cerebellum, the results of which he sums up as follows:—

1. The cerebellum arranges definite motor processes; its function is also to some extent motor. This relation to motor processes is shown both by irritation and by destruction.

2. All the phenomena show an intimate functional (as well as anatomical) connection between the two halves of the cerebellum.

3. The complete destruction of the same part of the cerebellum which gave rise, when irritated, to the before-mentioned motor effects, was not followed by any "negative phenomena." (*Ausfallserscheinungen*, Goltz.)

4. The destruction of one hemisphere, or of both alone, or of the anterior and superior part of the vermiform process alone, produced no abolition of co-ordination. No motor irritation phenomena followed the mechanical irritation of these parts.

5. The recognized destruction of co-ordination was produced only by such an injury as implicated at the same time the depth of both the hemisphere and the vermiform process.

He promises further observations on the special connection of these motor functions with those of the brain proper, and also a discussion of the co-ordinating function of the cerebellum.—*London Med. Record*, Jan. 15, 1877.

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The Functions of the Pneumogastric and the so-called Inhibitory Nerves.

M. ONIMUS (*Comptés Rendus*) publishes the results of a series of experiments upon the effects of electrical stimulation of these nerves. He says that an ordinary Faradic current is interrupted 30–35 times in a second, and that corresponds pretty well with the number of nervous shocks transmitted along special nerves, so that striped muscles usually respond well to the stimulus; but that automatic and rhythmically acting organs require some numerical relation to be observed between their rhythm and the stimulus, or the effect will be perturbation instead of increase of function. The author, as well as Charles Legros, found that, if the pneumogastric nerve were stimulated by a current interrupted at long intervals, no arrest of the heart's action took place, and that for this latter result 16 or 18 shocks per second were required for warm-blooded animals.

From new experiments made by the author, he announces that by even and moderate stimulation of the heart, at intervals corresponding somewhat to the existing cardiac rhythm, stronger contractions are produced, and that by this means the hearts of animals nearly poisoned by curare or chloroform can be re-awakened to functional activity.

The peristaltic action of the intestines, which is arrested by the ordinary Faradic current, was increased if the interruptions were somewhere about

equal to the normal rhythm of 15 or 18 per minute: for this result to be obtained it was found necessary that the intestine should not be empty.

The vaso-motor nerves he found to be similarly influenced, currents interrupted at long intervals producing not tonic contraction, but dilatation with increase instead of lowering of the temperature. He concludes that the nerves of vegetative life and of unstriped fibre, above all when they belong to organs which have rhythmic, co-ordinated, and automatic movements, do not respond to artificial stimuli in the same way as spinal nerves. When the excitations become too numerous and too rapid, they cease to provoke functional acts, and become causes of perturbation. The phenomena of arrest which have been obtained in these conditions are the results of this pertubation. Moreover, it seems from his experiments that the alleged depressor nerves come under the general laws of action of all the nerve-filaments, their physiological excitation provoking always the activity of the organs to which they are distributed.—*London Med. Record*, Jan. 15, 1877.

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On the Different Action of the Right and Left Pneumogastric Nerves.

At the meeting of the *Société de Biologie* of Paris, Dec. 9 (*Progrès Médical*, Dec. 16, 1876), M. Tripier read a paper on this subject. He first related experiments which he had made with M. Arloing, from which it appeared that the right pneumogastric acts more especially on the heart, and the left on the lung; but he remarked that variations exist according to the species of animals and individuals. Sections of one of the pneumogastrics could cause death. There are extant at least two cases of death in man after division of the right pneumogastric. In the ass, in twelve divisions M. Tripier observed seven deaths, four times from division of the right, and three times of the left; in the rabbit, in nine divisions, three deaths, all from the right; in the horse, on the other hand, in more than forty divisions only one death took place, and that was after division of the right pneumogastric. It appears that in some cases the cause of death is found in paralysis of the lower part of the œsophagus, to the constant accumulation of food in that part of the digestive tube, and its penetration into the air-passages. In ligature of the large vessels of the neck, it would be dangerous to include the pneumogastric nerve.—*London Med. Record*, Jan. 15, 1877.

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Relations of the Liver to the Formation of Urea.

Evidence has been accumulating for some time past tending to show that intimate relations exist between the liver and the production of urea in the system. By Meissner it was remarked long ago that urea was contained in considerable quantity in various glands, but especially in the liver; and Prévost and Dumas pointed out that the amount contained in the liver was increased after extirpation of the kidneys. Budge demonstrated that the disintegration of the albuminoids is very active in this gland; and Cyon that if the blood be transmitted through the vessels of the liver the proportion of urea contained in it is augmented; and the general opinion of physiologists is in accord with the view originally taken by Bowman, that the urea is not formed at or by the kidneys, but that these organs serve only as filters, by which it is removed from the blood as fast as it is formed. A remarkably interesting memoir has just been published in the *Archives de Physiologie*, in which M. Brouardel adduces many striking pathological facts in favour of the view that urea is formed, in part at least, if not wholly, in and by the liver. The conclusions at which he has arrived, given in a somewhat abbreviated form, are that in severe cases of icterus, the proportion of urea in the urine diminishes, or altogether disappears; that in the form of icterus produced by phosphorus poisoning, whether accidental in man, or the result of direct experiment on animals, the amount of urea undergoes considerable diminution; although in simple jaundice the quantity of urea eliminated does not diminish, and if present in large quantity the circumstance may even be regarded as affording grounds for a favourable prognosis.

In suppurative hepatitis, the amount of urea, as was shown by Parkes, augments in the earlier periods of the disease, but it diminishes when the abscess has destroyed a large portion of the liver, though there may be a considerable degree of coincident fever. In biliary lithiasis leading to obliteration of the ductus communis choledochus and atrophy of the hepatic lobules, the urea diminishes in quantity. The diminution appears to be most notable during the crisis of hepatic colic, and the same thing is observed, according to Regnard, in intermittent hepatic fever. In cirrhosis, whether of the atrophic or of the hypertrophic form, the quantity of urea eliminated is extremely small, even when the patient continues to eat well. In diseases of the heart, the development of cardiac liver causes considerable diminution of the excretion of urea. The variations consequent on repose and appropriate treatment may serve to establish the prognosis. In cases of fatty degeneration of the liver occurring in phthisical patients and in those affected with suppuration in the bones, the proportion of urea falls to a very low point. As a general rule, it may be stated that in cases of chronic disease of the liver, such as cancer or cystic disease, the destruction of a large portion of the substance of the organ is attended by a fall in the proportion of urea. On the other hand, cases of congestion of the liver are indicated and characterized by an augmentation in the elimination of urea; and so also in transient glycosuria the urea rises when the sugar is present, or just at the period of its disappearance; whilst in diabetes the amount of urea exceeds in some instances the quantity present in any other disease. Lastly, in lead colic, the liver contracts and the urea is diminished, but when the colic has passed off, the liver resumes its normal size, and the amount of urea becomes normal.

From all this M. Brouardel believes that it may be regarded as demonstrated that in diseases of the liver the quantity of urea secreted and eliminated in the course of twenty-four hours is dependent on two principal conditions—first, the state of integrity or of alteration of the hepatic cells, and, secondly, the greater or less activity of the hepatic circulation. It follows, he observes with reason, that the variations in the quantity of urea eliminated by the kidneys, providing these are healthy, may be employed at the bedside to establish the diagnosis and prognosis of lesions of the liver.—*Lancet*, Jan. 13, 1877.

A slight acceleration of the pulse, five to ten beats per minute, is common, though it falls as the cutaneous secretion diminishes. An increase of temperature (0.5° to 1° C.) occurs, and a pronounced feeling of chilliness is complained of. The contraction of the pupil begins late, and generally lasts longer than the other phenomena by twelve hours.

With regard to its application in practical medicine, the author recommends it strongly for cases of opacity of the vitreous body following irido-choroiditis, ten or twelve applications producing a most marked effect. In a case of croup in a child, in which tracheotomy had been performed, and which exhibited pronounced œdema of the lungs, the injection of a Pravaz syringe full of a two per cent. solution, produced a copious secretion of saliva for three and a half hours, when the asphyxia had quite disappeared. No ill effects followed the injection.—*Lond. Med. Record*, Jan. 15, 1875.

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Balsam of Peru as a Dressing for Wounds.

Dr. Wiss recently made a communication to the Surgical Society of Berlin on the surgical uses of balsam of Peru. He had used it with excellent results in the treatment of wounds of all kinds—incised, gunshot, and suppurating wounds, and wounds attended with loss of substance. Its application was attended with a sensation of burning; but all pain soon ceased, even in the most severe wounds. Its application to recent wounds did not produce inflammation or suppuration; and if these were already present, they ceased. In none of the cases thus treated by him were there any signs of putrefaction, even in the most unfavourable conditions of locality and climate; and in all, even in lacerated wounds, union took place by the first intention. In one case, a young man had received a lacerated wound of the head from a blunt-pointed instrument. The aponeurosis of the occipito-frontalis was laid bare on the top of the head, and the skin lay separated in three flaps. After arresting the hemorrhage and cleansing the wound, Dr. Wiss poured Peruvian balsam into it, and applied a compress and bandage. The next day he was astonished to find that the wound had half healed, and that there was no suppuration; and in two days the healing process was completed. In 1875 he had under his care a boy, the points of whose right middle and ring fingers had been torn off by the fall of a sharp plank. On the ring-finger only there was a thread of skin

FOREIGN INTELLIGENCE.

Falling-out of Hair.—Prof. ERASMUS WILSON, in cases of defluvium capillorum, prescribes a lotion composed of strong liquor ammoniæ, almond oil, and chloroform, of each one part diluted with five parts of spirits of wine or spirits of rosemary, and made pleasant as to fragrancy by the addition of a drachm of the essential oil of lemons. This should be dabbed upon the scalp after thorough friction with the hair-brush. No doubt there are cases in which this lotion must be used with caution, or largely diluted. In cases of alopecia he recommends frictions with a liniment composed of equal parts of the liniments of camphor, ammonia, chloroform, and aconite, to be well rubbed into the bare places daily.—*Med. Record*, Aug. 25, 1877.

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Cerebral Thermometry.—M. BROCA communicated to the Association Française pour l'Avancement des Sciences, which was sitting at Havre towards the end of last month, an interesting paper on the above subject. We are indebted to our contemporary *Le Progrès Médical*, No. 36, for the following details. M. Broca believes that thermometry wlll become a valuable aid in the diagnosis of brain disease. He uses very delicate thermometers, and, after applying them to corresponding positions on the two sides, covers with wool the part of the bulb which is not in contact with the skull, in order to guard against any thermic influence which the surrounding air might exercise. M. Broca has usually employed six thermometers, which were placed in sets of three pairs on corresponding parts of the skull. The anterior pair were placed directly behind the orbital apophyses, the middle pair above the ear, and the posterior pair in the occipital region. His first care was, of course, to obtain the average temperature, and to this end he tested the temperature of his *internes* and dressers at the hospital. He found that the maximum temperature of the brain was 34.85° C., and the minimum 32.80° C., the *mean* temperature therefore being 33.82° C. But, further, he found that the thermometers on the *left* side invariably marked a *higher* temperature than those on the *right* side. Thus, on the right side the mean temperature was 33.90°, while on the left side it was a little over 34°. The difference was found to average about one-tenth of a degree; *but this difference is only found when and so long as the brain is at rest.* When the brain is active the equilibrium tends to establish itself, and the temperature figures correspond. M. Broca argues that the left hemisphere is more freely supplied with blood than the right, and that the latter, less prepared and less apt, when brain-work has to be done, requires a larger supply of blood than the left, and hence the temperature on the two sides becomes equalized. Further, M. Broca has found that not only on the two sides of the brain is there a difference, but that this extends to different lobes of the same side; thus he has shown that the temperature of the occipital lobe was only 32.92° C., that of the temporal lobe was 33.72° C., and of the frontal lobe 35.28° C., which is accounted for by the greater functional activity of the latter. Then when the brain is actually working there is a rise of temperature; thus, after reading aloud for ten minutes a rise of about *one half of a degree* can be shown. The clinical bearings of these observations are not less important. M. Broca considers that the thermometer supplies an additional and an important sign of cerebral embolism; he can even diagnose the part of the brain which is deprived of its blood. As the result of his observations, it appears that at the level of an embolism there is a decrease in the temperature. The subject is necessarily in its infancy at present, but with the aid and example of such an authority on matters craniological as M. Broca, we shall hope shortly to be in a position to publish more extensive details. —*Med. Times and Gaz.*, Sept. 15, 1877.

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Cholera from the Laundry.—Incidents confirming the belief that diseases are spread by laundries are constantly reported to us as occurring, not only in England, but also on the continent, and our efforts at reform in this respect have been generally approved abroad as well as at home. Dr. H. Lebert, corresponding

member of the French Institute, and recently Professor of the Breslau University, has informed us of several cases which, occurring under his own observations, further illustrate the dangers we have attempted to describe. The last epidemic of cholera which afflicted the inhabitants of Zurich was, it appears, traced to a washerwoman. Without hesitating, and without employing any special precaution, this woman washed the linen belonging to a child who had been ill with cholera, and, as the penalty of her imprudence, contracted the disease, and died from it. The germs thus sown in the laundry were soon propagated, first to the inhabitants of the street, to the washerwoman's immediate neighbours and customers, the scourge afterwards spreading all over the town. Previously there had been no case whatsoever of cholera. It attacked first the child, and was then spread throughout the town by the washerwoman. At Branson, near Martigny, in French Switzerland, Dr. Lebert was acquainted with a sister of charity, who took excellent care of some persons suffering from cholera. When the epidemic was over, the sister devoted herself to washing the linen of her patients. She had escaped the infection in the execution of her duties as a nurse, but fell ill after washing the clothes, and died. The loss of this valuable life was due, therefore, to the want of proper means of disinfection. Finally, Dr. Lebert relates that four washerwomen employed to cleanse the linen belonging to the Breslau Hospital contracted typhoid fever. These women lived in different quarters of the town, but they had all washed linen taken from typhoid patients; thus it is probable that they were also victims of the carelessness so universally displayed when dealing with soiled linen. It is very unlikely that four washerwomen, each living in different parts of the town, would all have simultaneously fallen ill with the same disease, but for the fact that they were brought into personal and prolonged contact with what would appear to have been contaminated clothing.—*Lancet*, Oct. 27, 1877.

The British and Foreign Medico-Chirurgical Review.—We regret to find in the October number of the *British and Foreign* the announcement of the discontinuance of this well-known periodical. Commenced thirty-eight years ago, under the able editorship of the late Sir John Forbes, it soon deservedly attained the high position in medical literature which it held for a long number of years. Its reviews were able and learned expositions of the subjects of which they treated, and were contributed by authors who were themselves leaders in the science of the day.

Under the successive editorships of Sir John Forbes, Dr. Parkes, Dr. Carpenter, Dr. Sieveking, and Dr. J. W. Ogle, and with such able contributors as Neil Arnott, William Baly, Golding Bird, George Budd, Sir James Clark, Wharton Jones, Aston Key, Sir Ranald Martin, Richard Owen, William Sharpey, and others of like distinction, it would appear unnecessary to say that the "Review" fully met the needs of the students in the profession.

In seeking for a cause for the late decline in its circulation, until it has finally reached a period "when to continue to publish it would incur an annual loss," the publishers assign it to be in that "a quarterly, with its thoughtful articles and well-digested reviews, is no longer appreciated as formerly." We should be sorry to think this of the present generation of medical men in Great Britain. The true cause, we are inclined to believe, is, and we regret to say it, the well-known fact that of late years there has been a most noticeable decadence in the ability displayed in the pages of the "Review," until it has at last ceased to be, as it was of old, indispensable to its *clientèle*. The many readers of the "Review" in this country, who had hoped that it would again see better days, will be sorry to learn of its discontinuance.

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The Chair of Clinical Surgery in the University of Edinburgh.—Mr. Thomas Annandale has been appointed to fill the vacancy created by the transfer of Mr. Lister to London. Mr. Annandale is an adherent of the antiseptic method.

P.

22

Cerebral functions

Sleep

* My hospital case:
memory on first seeing a place:
R. N. T., &c!

* Ideation, cerebral action
not out-spending itself. Cellular & Molecular reaction.

Heat with unexpressed emotion, (Lombard)
Tears — laughter! (H. Spencer)
Demonstrative people — "too deep for tears"
"satisfaction" — Treatment of insane according (Carpenter, Hum. Phys p. 766 note)

In certain cases of paralysis, the will has no power over muscles, which emotion brings into action.

Moral insanity — moral idiocy.
Ecstasy — melancholy, — pervading all ideas.

* "He wrote in numbers, for the numbers came."
Poets & other men of genius often labor to correct & finish — i.e., to realize the spontaneous ideal within their minds. But Vathek was written by Beckford at a single sitting — in 3 days & two nights. Byron sometimes wrote very fast. Scott often composed or hoselorhn Dickens wrote slowly
Colendge's talk — Improvisation

act *as one.* Probably the *corpus callosum* is the main medium of their intimate correspondence.

3. The brain is, as regards the mental faculties, a *multiple* organ. This is proved by many facts; as, the *partial* mental activity of dreaming and somnambulism; partial insanity or monomania; the limited effects, upon the mental and moral powers, of some injuries; and those peculiar, special gifts of mind, so different in different individuals, to which we give the name of genius.

4. The system of "phrenology," or cranioscopy, taught by Gall, Spurzheim, and Combe, is not sustained by a sufficient preponderance of evidence to enable it to take its place as a part of physiological science.

Lately, the most remarkable suggestion tending in a similar direction to that of Gall's inquiries, is that of Broca and others, growing out of the facts concerning *aphasia.* This name is applied to loss of the power of expression in language, spoken or written, from cerebral disease. *Post-mortem* examination in a number of cases has exhibited some lesion of the anterior portion of left hemisphere of the cerebrum. Broca and others have hence inferred that this part of the brain is the seat and organ of the "faculty of language." The principal objection to this view is, that it supposes an *unsymmetrical* location of function, in a part of the system, the cerebro-spinal axis, which, elsewhere, so far as is known, is entirely symmetrical.[1]

5. *Reflex action* affects the cerebrum, as it does all lower nerve-centres. Especially is excito-motor agency visible in *emotional* actions.

Dr. Carpenter's theory is, that *emotion* consists only in the attachment, in our consciousness, of either pleasure or pain to an *idea.* This is not, however, well sustained by familiar facts. Especially is it contradicted by the evident distinction that emotions, unlike ideas, are always *impulsive;* they form our *motives;* we are moved by them. Hence it is probable that different parts of the brain are the seats respectively of the intellectual faculties and of the emotions.

6. Not only is mental action often reflex, being induced by the *suggestion* of impressions external or internal—but it is also in many instances *automatic.* Will acts, not by direct compulsion of the faculties, but by the directing and selecting power of *attention.* We thus encourage and sustain preferred trains of thought; or, on the contrary, avert attention from those not approved. So, also, with emotions. Dwelling upon an object which naturally excites feeling, will still maintain this, even if the will struggles directly against the emotion itself.

[1] See an account in *American Journal of Medical Sciences*, July, 1868, p. 296, of a remarkable case of injury of the head, in which loss of language followed penetration of the *right* half of the brain.

Childhood exhibits the automatism of mental action most fully. Emotional impulses are stronger than mere instincts in youth; maturity brings the full development of the intellectual powers. Over all of these, the will ought to dominate; but some human beings remain, all their lives, automata, under the continued dominion of impulses.

Remarkable exemplification, however, of the spontaneity or automatic character of the action of the mind, is witnessed in the manner of performance of great and peculiar genius. Often, highly gifted men are notably deficient in power of will; as shown by their impulsive nature and want of self-control. Carpenter adduces, as good instances of this, Mozart, the musical composer, and Coleridge, the poet and philosopher. Zerah Colburn in calculation, and Morphy in chess, are examples of different kinds of extraordinary natural superiority in particular gifts. Not always are such powers attended by uncommon general intelligence. Of the absence of this, Blind Tom, the negro pianist, a musical prodigy, but otherwise almost an idiot, is said to be an example.

7. There is reason, even, to believe, that mental action or "cerebration" may sometimes be *unconscious.* Dr. Carpenter's arguments in favor of this view are interesting and convincing; but would occupy too much space here.

Begin 5th Review, 71. To End, new top 6.300, "The Compass of the Voice."

End Review 72

SLEEP.

Only the cerebrum, the organ of the mental faculties, among all the nerve-centres of the body, has prolonged periods of complete repose in the order of nature. Short intervals, every centre, every organ in the body has; in the *alternations* or rhythmic actions which all exhibit. Thus, between each two inspirations, and between each two beats of the heart, short rests occur. But the brain must have several hours of continuous repose, every night or day.

In the soundest sleep, total unconsciousness exists. Between this and sleep-walking, or somnambulism, all degrees may occur. The entire explanation of the physiology of sleep is not yet attained. The most interesting fact fully developed of late years is the observation of Durham and others, that during natural sleep less blood flows through the brain than at any other time; the cerebral hemispheres becoming, from diminished activity of their arterial circulation, comparatively anæmic. Dreaming. Delirium. Coma.

Difference about awakening. Common not — but name!

In somnambulism, the sensori-motor powers appear to be, sometimes, as perfect as in the waking state; but acting automatically. Artificial somnambulism, which may be produced in some susceptible persons, has been exaggerated in description, into mesmerism or animal magnetism, &c.

Braid's hypnotism.

Mental Hygiene, & Insanity — next.

(7)

Brain exper.

Am. Journ. Med. Sci. July 74 p. 238

In Ferrier's second paper

Royal Soc. March 5, 74,

he asserts occip. lobes do not react on stimulation — their destr. caused no loss of sensation or voluntary motion, but an apparent loss of the instincts of self preservation"!

[See Dalton, pp. 489, 490]

In pigeons, only result of stim. of cerebr. hem. vis. contrac. of pupil.

[when cerebr. hemisph. removed, muscular movements still produced]

Cerebell. for regula. of motion of eyeballs and bodily equilibrium.

(4) Ferrier divides whole brain into sensory & motor portions, corresponds to their anatomical rela. to thalami & corp. striata, & sensory & motor tracts.

Vulpian's experi. show super. cerebral ganglia of sympa. cannot be only centre of nerves of dilator muscle of iris

Hygiene

Ant. & Post. Brain

Alex Bennett

exper with cocaine on animals –

Similar effects to thein &c; cerebral excitement, paral. of sensitivity – tetanic spasm & death –

Foster – exper on dogs & pigeons, shown death when no inorganic salts in food – from altera. in nervous system –

(b)

On Ferrier &c

Prof. L. Hermann (Pflüger's Archiv, Heft ii, 1875), see Am. Journ. Med. Sci. July 1875 p. 229-30 — disproves the location of the excitable centres — "motor centres" in the gray convolution any surface of the cerebrum — by cauterizing that surface, & yet finding the (motor electrical) results; & even taking out cylindrical portions & still getting the motor results. The extent of the excitable areas depends also on the intensity of the current.

(5)

N. B.

On

Terrier!

N. Y. Soc. of Neurology & Electrology May 18th 1874

peated during the past winter before the Royal Society in London. Before returning to Europe, Dr. Dupuy has kindly consented this evening to favor us with a repetition of these experiments in vivisection, an interesting and valuable contribution to cerebral physiology.

Dr. Eugene Dupuy then proceeded, by the aid of a series of extremely delicate and successful vivisections, to examine the theory of the existence and localization of motorial centres in the cerebral hemispheres. His subjects were two small dogs and two guinea-pigs. His object in exhibiting the guinea-pigs, which had been operated upon some time since, was to demonstrate the fact that the absence of the cerebrum did not deprive the legs of the power of voluntary movement. The theories deduced by Dr. Dupuy were diametrically opposed to those of Fritsch and Hitzig and Professor Ferrier, though the experiments were precisely similar in character.

Dr. Dupuy's conclusions from his experiments may be thus briefly summarized:—

I. That it is possible, by exciting certain points of the cortical layer of the cerebrum, to obtain contractions in every limb.

II. That, as a rule, the fore-limb of the opposite side is that affected.

III. That the electric current must be propagated to the base of the cerebrum to excite either the nerves which arise from it, or the base itself, or the pons varolii.

IV. That if the dura mater be electrically excited, contractions are observed in the foreleg, and generally in that of the opposite side.

V. The fact that the galvanoscopic frog is thrown into a state of contraction when its nerves touched some point of the cerebral mass far from the point excited, confirms the view that the electric current is propagated.

VI. Contrary to the effects obtained by Ferrier, Dr. Dupuy has never been able to obtain any effects upon the tongue, either of projection or retraction.

VII. The whole cortical layer of the cerebrum is probably a centre of reflection for a certain kind of sensibility capable of exerting a reflex action on motor or sensory nerves, but that its presentation is not indispensable for the manifestations of voluntary and even intelligent action.

VIII. In the animals on which Dr. Dupuy has experimented, contractions of the opposite limbs can still be produced, even after the ablation of the optic thalami and corpora striata of the opposite side to that on which the irritation has been applied.

Dr. Austin Flint, Jr., thought that Dr. Dupuy's periments had proved that Dr. Ferrier's conclusions, which had previously been looked upon as definite in their character, were, in fact, indefinite and unreliable. The portions stimulated were not the portions exposed to experiment. Guinea-pigs were especially liable to diffusion, consequently the movements of those animals differed materially from the movements originated by the stimulation of the motor nerve. He thought the points put forth by Dr. Dupuy were well sustained.

Dr. J. W. S. Arnold remarked that there must be diffusion, but how much or in what direction it is impossible to determine. It was quite as easy to discover by the galvanometer as by the galvanoscopic frog.

Dr. Beard observed that the current was diffused at a considerable distance from the electrodes. The current contracted the sciatic nerve when it did not influence the brain or cerebral substance. There was a varied susceptibility in several parts of the body.

(5)

(5)

To *reduce* the net cost to the Government over 51 per cent.; and, as a consequence,

To diminish the amount of the deficiency appropriation for the current year to only 40 *per cent. of that of* 1871.

AN ESSAY UPON SYPHILITIC STRICTURES OF THE RECTUM. (ESSAI SUR LES RETRECESSEMENTS SYPHILITIQUES DU RECTUM.) By Dr. EUGENE GODEBERT. Paris, 1873

THIS subject, although largely written upon, is perhaps to-day one of the least clearly settled in syphilography, consequently any opinions regarding it, though they may not be conclusive, are interesting as expressing the views of one who has given attention to it. The present author has taken it as the subject of his inaugural thesis to the Faculty of Medicine of Paris, and he reproduces, in the main, the views of the well-known Parisian surgeon M. Demarquay. As a basis of his work he studies fifty-five cases, which are reported by others, and besides these he adds twelve personal cases, making a total of sixty-seven. Of these he traces a pre-existent syphilis in forty-seven cases. He alludes to Gosselin's theory of the starting-point of the process being specific ulcerations around the anus, which lead to inflammation of the lower parts of the rectum, and consequent contraction, and to the theory of Després, that these strictures result from phagedenic chancres. He divides these strictures into three classes:

1. Those which appear in the secondary period, following mucous patches, and which he thinks may be called secondary strictures.

2. Those of the tertiary period, which are due to deep syphilitic ulceration.

3. Those which appear later on in syphilis, to which M. le Professeur Trélat has given the name quaternary strictures. They consist of a fibrous thickening of the rectal walls, developed under the influence of the syphilitic diathesis. After having detailed several cases, he draws the following conclusions as to the first variety:

1. Secondary strictures result from mucous patches which have involved all the circumference of the anus.

2. They are seated at a variable height, from two to eight centimetres, but they are always more or less accessible to the finger.

3. Their height (up the rectum) does not go beyond usually one or one and a half centimetres.

The tertiary strictures are rare, but still the author thinks that they exist. He reprobates the view of Bärensprung, to the effect that they are due to a scorbutic condition of the blood. The features of these strictures are described as being round, surrounded with a ring of fibrous tissue, having a hard base involving the mucous membrane, and perhaps the muscular coat.

The quaternary stricture is a general neoplastic infiltration of fibrous tissue under the mucous membrane, due to the influence of the syphilitic diathesis. This is the view of M. Demarquay, and is the one entertained by the author. He agrees with M. Guerin as to the fallacy of the view that these strictures are due to scrofula.

Besides the conclusions already given, the author adds the following:

1. The physician should always examine or look for rectal ulcerations, secondary or tertiary, in a syphilitic patient who gives the slightest suspicion of their existence.

2. Besides a local treatment it is necessary to use specific medication.

3. When a stricture is once formed, anti-syphilitic treatment is powerless for its cure.

4. It is necessary, then, to have recourse to surgical

THE U.S. ACADEMY OF SCIENCE

SESSION AT WASHINGTON

THE U.S. National Academy of Science held its meetings this year at the Smithsonian Institution, the venerable Prof. Henry, secretary of the Institution, presiding over the deliberations of the Academy. The session commenced on April 21 and lasted four days. By favour of the scientific editor of the *New York Tribune* we have obtained advanced reports. Our space permits us to give only the titles of the more important papers; but as Dr. Brown-Séquard's paper on the functions of the brain is of very great interest in reference to recent researches on the subject, we shall give a longish abstract of it.

Among the papers of importance were the following:—Dr. J. L. Le Conte read a paper On a classification of the *Rhynchophorous coleoptera*. Prof. Fairman Rogers described an automaton to play tit-tat-too, which he had constructed.

Prof. A. M. Mayer read three papers, one entitled "Suggestions as to the functions of the spiral scalæ of the Cochlea, leading to an hypothesis of the mechanism of audition." The second paper was headed "Abstract of a research in the determination of the law connecting the pitch of a sound with the duration of its residual sensation, and on the determination of the number of beats—throughout the range of musical sounds—which produce the most dissonant sensations; with applications of these laws to the fundamental facts of musical harmony, and to various phenomena in the physiology of audition." Prof. Mayer gave the particulars of a series of experiments by which it was ascertained what must be the frequency of successive sounds to have them blend indistinguishably together. The third described a series of experiments on the reflection of sound from flames and heated gases.

Prof. Simon Newcomb, the astronomer in charge of the Washington Observatory, gave a description of the preparations in America for the observation of the coming transit of Venus. These are most thorough and complete.

Prof. Wolcott Gibbs, of Harvard University, read a paper On metamerism in organic chemistry. Prof. Gibbs has discovered six metameric bodies, a seventh having been discovered by Prof. Erdmann.

Comparative velocity of light in air and in vacuo, by Prof. Stephen Alexander of Princeton College. This brief paper merely contained a few interesting suggestions on a small correction of the velocity of light as deduced from experiment.

In accordance with the undulatory theory the velocity of light must be less in atmospheric air than in vacuo, in the inverse ratio of the index of refraction of atmospheric air to 1; that is, as 1 to 1·000294. The velocity then as ascertained by experiment under the air should be increased by just about 0·000294 of itself to be equal to that in vacuo; *i.e.* to the extent, almost exactly, of 55 miles per second; a very small quantity indeed in comparison with the whole velocity of 185,000 miles per second; and yet, small as it is—and so small as to be below the limits of error of the experiments in question—it is yet very closely equal to three times the velocity of the earth in its orbit.

It is an outstanding excess, and no more, with which we often have to do, as, for example, in the measurement of temperature; but the scale on which those differences sometimes present themselves makes them, small as they may be in their original comparison, grand in comparison with ordinary standards. Prof. Alexander was not aware that anything has yet been put forward elsewhere on this subject.

Prof. Hayden gave a general account of the scientific explorations and survey in the West in which he has been engaged. With the results of these our readers are already pretty familiar.

In a paper On the laws of cyclones, by Prof. William Ferrel of the Coast Survey, the author gave a *résumé* of our knowledge on the subject and of some of the theories which have been advanced.

Dr. E. Bessels read a paper entitled "The History of Smith's Sound from a Geographical and Geological Point of View, and some other General Results of the *Polaris* Expedition." Dr. Bessels thinks that Smith's Sound must be regarded as the best of the three gateways to the pole. The land found between 81° and 82° seems to Dr. Bessels to be of great importance in demonstrating that Greenland has been separated from the continent in a south-north direction. Dr. Bessels stated several important facts bearing on the rising and sinking of the land on the Greenland coast.

Prof. Simon Newcomb gave a description of the great telescope at Washington; and a paper by Prof. S. Alexander of Princeton, N.J., On three of Jupiter's satellites, was read.

Prof. J. S. Newberry of Columbia College, New York, read a paper On Lower Silurian fossils. This was a memoir on the so-called land plants of the Lower Silurian in Ohio. Taking all the characters of these interesting fossils into consideration, Prof. Newberry is disposed to regard them as casts of the stems of fucoids.

The following papers were read by title only:—A memoir on the zodiacal light, by Prof. S. Alexander; On some points in Mallet's theory of vulcanicity, by Prof. E. W. Hilgard; The polarisation of the zodiacal light, by Prof. A. W. Wright. An exceedingly interesting and valuable paper on the mode of formation of the earth, its condition as to interior fluidity, and the probable limits within which it was reduced from a fluid state to its present condition, under the title of "A Criticism on the Contractional Hypothesis of the Earth's Surface Changes," was read by Capt. Clarence Dutton of the Ordnance Corps, U.S.A.

Dr. Brown-Séquard began his paper On the pretended localisation of the mental and the sensorial functions of the brain, by saying that the subject has been rendered more difficult by assumptions of physiologists upon insufficient data. Among the views which have been recently brought forward upon the localisation of nervous power in certain parts of the brain, there are two of importance: one relates to the seat of power actuating muscles, and the other is as to the seat of sensation for different nerves. In the latter particular, after noticing several exploded theories, some still pertinaciously adhered to by physicians, Dr. Brown-Séquard reviewed especially the assumption in respect to the seat of power for speech:—

"Let us consider the question of the locality of the intelligence of the brain. Most physiologists are agreed that this is the grey matter of the upper parts of the brain. But the method of communication is still open to research." (Here the lecturer went to the blackboard and drew a figure somewhat like a sheaf of wheat without a band around it; the stalks representing the nerves, the heads of wheat representing the cells.) "Now you may subtract from this, by disease or otherwise, say the upper third, and still you have the nerves and the nerve cells, and the processes can be carried on; but in the progress of such destruction downward there would eventually be reached a point where the functions of the brain could no longer exist. This view would explain the facts as we find them. But there is no case on record where the grey matter on both sides of the brain has been destroyed without the loss of intelligence, and we must regard the grey matter as the seat of the intelligence. But vast portions may be removed before the loss of intelligence becomes apparent. This I have myself tested and proved by vivisection of the lower animals.

"Now, in respect to the locality of the power of speech. It has been said that the loss of brain power to express ideas in speech was located in a certain part of the brain. This affection is called aphonia or aphasia. There are three modes of expressing ideas—by speech, by gesture, and by writing. It is with the first only that we are concerned. Some very bold theorists have tried to locate all these powers in a particular part of the brain. Let us confine ourselves to facts. Dr. Broca of Paris has advanced the view that a certain small portion of some of the convolutions of the brain holds the power of speech. I admit that facts seemed to favour this view. But we find that there is no relation between the degree of aphasia and the extent of the disease of that part, and there are cases where the destruction of those convolutions is very great, and the injury to speech very little. Secondly, we find that disease may have overtaken the anterior, the posterior, and the middle lobes of the brain, the particular convolution supposed to involve speech not being affected, and yet there is marked aphasia. Now, is some one of these lobes the locality of the power of speech? Such would be the reasoning of my opponents. We should be obliged to concede that in some persons the faculty of speech existed in one part of the brain, in some in another, in others another, and so on *ad infinitum*. This is a *reductio ad absurdum*.

"There is the case of the paralysis of the insane, where the grey matter may be diseased on both sides of the brain. In these cases the power of speech does not seem to be involved. There are cases of aphasia where the diseased person has had the power of speech restored during delirium. The speech is coherent though the sense may not be. It is evident, then, that the faculty of speech is not actually lost in such cases; and yet we find that the third frontal convolution is actually diseased in those aphasiacs who talk in their delirium. But the most decisive argument is found in the cases that I have seen, where the third frontal convolution, the alleged organ of speech, has been destroyed, and yet the patients have not lost the power of speech. Therefore the theory is itself destroyed. There are fifty cases on record to show that the question of right-handedness or left-handedness does not apply in the considerations." The lecturer here cited cases of Jacmet of Montpelier and Mr. Prescott-Hewitt of London. In the latter case the patient had suffered a destruction of that part of the brain for twenty years, and yet for twenty years had spoken.

"We shall now take up the question of the localisation of motion in certain parts of the brain. I am surprised at the avidity with which a certain series of facts has been accepted as proof of this theory in England. A very eminent man, of whom I should not like to say anything severe, my friend Prof. Carpenter, has accepted those views. I may say that all England has accepted them. Prof. Huxley, indeed, has written me, that he only accepted this view in part, but I cannot see how he can accept a part without accepting the whole, where even the part is incorrect. The famous experiments of Dr. Ferrier, of Guy's Hospital, must here be considered. As you will see, they are not, however, conclusive. By the application of galvanism to certain parts of the brain of animals, he produced certain movements. When we do not stop to think, this would seem to prove that there are in the brain certain centres of movement governing certain parts. But it is only a semblance. A part of the facts are taken for the whole. We should know all the series before we adopt the conclusions. Let us examine the other facts.

"It is perfectly well known that the cutting away of a large portion of the brain does not produce the least alteration of voluntary movement any where. Suppose that part of the brain, say the anterior lobe, being excited by galvanism, produces a movement in the anterior limb; now suppose that part of the brain is cut away, then the anterior limb should be paralysed, for its voluntary movement is gone. Admitting that the other half of the brain should supply the place of the missing part, let us take that away also; then certainly there should be a paralysis of the anterior limbs. But there is not. This should be sufficient to invalidate the conclusions of Dr. Ferrier. But there are abundant pathological facts of this nature proving the fact beyond question. And then there are the cases of recovery from paralysis. There is no such localisation of power as Dr. Ferrier has assumed. If galvanism be applied to the severed leg of the frog the leg will jump although there is no brain power in the question.

"What should have been done was to have cut the connection of parts, so that a general effect should not have been propagated throughout the brain by the application of galvanism to a part. This would be the *experimentum crucis*. My friend Dr. Dupré of Paris has made this experiment. I made it also, before he did, but he published his before mine. But there are many other facts almost equally impressive in their character which may be cited. We find many cases where the lesion of part of the brain produces paralysis on the same side of the body, and not on the opposite side, as in the majority of cases is the rule. There is a case recorded where a ball passed directly through the brain, and it produced paralysis on the right side, instead of the corresponding side." Here Dr. Brown-Séquard objected to having a certain class of brain affections named after him, stating that diseases should be named from their distinctive features, and not after physicians.

Dr. Brown-Séquard then applied a similar course of reasoning to the localisation of sensation in specific parts of the brain, concluding by stating that it is evident we cannot locate the centres of either sensation or motion in specific parts of the nervous system.

THE LONG PERUVIAN SKULL

I WISH to place before comparative anatomists and anthropologists a question which has been encumbered by some misleading inaccuracies, in a recent communication by Dr. J. Barnard Davis to the Anthropological Institute, ("On Ancient Peruvian Skulls" Journ. Anthropol. Inst., vol. iii., p. 94). So early as 1857, in communications to the British Association, and to the American Association for the Advancement of Science, I showed, in opposition to the views of Dr. Morton, and of all American ethnologists up to that date, that a dolichocephalic type of head is characteristic of certain wide diffused American races. At a later date I set forth, in "Prehistoric Man," my reasons for believing that this, which is now universally acknowledged as true in general, may be specifically asserted of the ancient Peruvians. This latter proposition Dr. Davis undertakes to refute; it is not a mere matter of personal controversy, but a question of some ethnical significance. As a Canadian, I lie outside of the charmed circles of home science and criticism, and only receive tardy news even of such communications as this, in which I have a personal interest.

Dr. Davis has not himself had an opportunity of examining the evidence on which my opinion was formed; and, in the communication above referred to, shows that he fails to appreciate its nature or true bearing. He says, Dr. Wilson's view, "which is that the dolichocephalic Peruvian skulls are of natural form, was combated in the 'Thesaurus Craniorum.' Since that book was printed, I have received ample and satisfactory evidence as to the truth of the proposition that the long skulls owe their quality to artificial means. By the politeness of Dr. J. Aitken Meigs, of Philadelphia, I have obtained two Peruvian skulls which at one period belonged to Dr. Morton's collection, as a specimen of each kind. One of

Prof. J. C. Dalton (N. Med. Record, Jan. 1875) reports repetition of Ferrier's experiments, with same results as his: no dissenting comments made by him! where was his brain?

LOCALIZATION OF FUNCTIONS IN THE BRAIN (*The Boston Medical and Surgical Journal*, July 29, 1875).—In a recent lecture, Dr. Brown-Séquard alluded to the various theories in the localization of functions in the brain, and to the fact that the character of the symptoms in brain-diseases is not in the least dependent upon the seat of the lesion, so that a lesion of the same part may produce a great variety of symptoms, while, on the other hand, the same symptoms may be due to the most various causes,—various not only as regards the kind but also the seat of the organic alteration. In view of these facts, he has been led to believe that lesions of the brain produce symptoms not by destroying the function of the part where they exist, but by exerting over distant parts either an inhibitory or an exciting influence, or, in other words, either by stopping an activity or by setting it in play. He concluded that if we survey all the facts brought forward to support the supposition that there are distinct psycho-motor centres in the brain, belonging to each set of muscles performing a distinct kind of movement, we find that it is impossible to admit that these centres occupy a separate, well-defined, and limited territory in some of the convolutions of the anterior and middle lobes of that organ; and we find also that the supposition that the nerve-cells endowed with each of the primary functions of the brain are disseminated through that organ, so that no local lesion or irritation can reach more than a part of those endowed with the same function or the same kind of activity, is supported by most of the known facts and out of harmony with none.

clear fluid drawn off. The removal of this fluid was followed by collapse of the tumor. Into the sac, which, however, was not thoroughly emptied, two drachms of a solution of iodine (iodine, ten grains; iodide of potassium, thirty grains; glycerine, one ounce) were injected with an ordinary syringe, the solution being diffused throughout the sac by gentle manipulation; the canula having been withdrawn, the opening was closed by a strip of adhesive plaster, and a light compress of lint applied over the tumor.

The operation was well borne, and not a single bad symptom resulted from it. The tumor gradually diminished, until it is now about the size of a walnut. The child recovered with its general health greatly improved, with no pain in what remains of the tumor, and with some indications of strength in the lower limbs.

ARNICA IN ORCHITIS (*The British Medical Journal*, July 17, 1875).—Mr. H. G. Knaggs reports a method of treating orchitis, which, he says, he has for many years found very effective. It consists in the more or less constant application, while the patient is resting, of a lotion of tincture of arnica and water (one part of the former to six of the latter) to the affected organ; secondly, in rubbing in an embrocation composed of one-third or even one-half tincture of arnica and soap-liniment two or three times a day along the course of the spermatic cord; and thirdly, in the internal administration of seven-drop doses of tincture of arnica, combined, when there is febrile disturbance, with two-and-a-half-drop doses of Fleming's tincture of aconite and acetate of ammonia. This simple treatment, he says, generally

The Localization of the Functions of the Brain.

Since the publication of Ferrier's researches on the existence of centres for voluntary movements in the cortical gray matter of the brain, and his repetition and extension of Fritsch and Hitzig's experiments, numerous observers have undertaken fresh experiments, with the view of correcting or extending the conclusions at which he arrived, and of criticizing his method of observation. So far as the main outlines of their results are concerned, if we except minor points of difference between Hitzig and Ferrier, as to the exact localization of certain centres, the majority of observers are agreed that the application of electrodes over certain well-defined and limited portions of the convolutions gives rise to certain definite movements of the limbs or face, which are usually of a combined nature; and that there are homologous centres in similar portions of the brain of different animals. But with regard to the interpretation of these results there is still much diversity of opinion: some observers agreeing with Ferrier that the movements are produced by excitation of the gray matter itself; whilst others, as Dupuy, Schiff, Brown-Séquard, and Burdon-Sanderson, consider that they are due to conduction of the galvanic current to the ganglia of the base of the brain, or to the pons and medulla. But it is due to Ferrier to remark that he does not deny that the current may be substituted for the normal nervous discharge of the convolutional gray matter, and conducted by the same white fasciculi to the basal ganglia; nor does it at all disprove the existence of such higher centres for the origination of movements through the influence of the will, that after removal of the cortical gray matter, as in Sanderson's experiments, the same movements result on electric stimulation.

Of the more recent observers on the subject, there are none whose experiments have a greater value than those of MM. Carville and Duret, both on account of their well-known ability and the amount of attention they have devoted to the subject. In two former communications to the Société de Biologie they criticized in detail the possible errors arising from diffusion of the currents employed; and in a more recent note, presented on October 10th, after answering certain objections to their former conclusions, they give the results of a fresh series of experiments, undertaken with the view of deciding whether centres for voluntary movements really exist in the gray matter of the convolutions, and also of determining more precisely the relation of the latter with the ganglia of the base of the brain.

With regard to the diffusion of currents, they have found that whilst there is superficial diffusion, as shown by Dupuy, and more recently by Gudden, there occurs also diffusion in the deeper parts, but that the currents seem to follow especially certain fasciculi of the corona radiata. Moreover, the careful removal of the cortical gray matter of one of Ferrier's centres, which Burdon-Sanderson has designated "active spots," or the section of the connecting fibres at various distances from the surface, did not prevent the occurrence of equally strong and localized movements on electrical excitation. It was necessary, however, to increase slightly the strength of the current employed: and the increase required was greater the deeper the section from the surface. They account for this necessity by the increased diffusion due to the exudation of blood on the cut surface; and to prove that this was the cause, they cauterized the surface of the wound made by removal of part of the convolutions, and found that no increase in the strength of the current was then needed.

These facts, however, whilst showing that the excitation of the cortical gray matter is not necessary for the production of localized movements, leave untouched the question as to whether the centres for voluntary movements really exist. That certain bundles of white fibres pass to particular points of the surface of the convolutions, and are there in organic connection with certain groups of nerve-cells, seems to be placed beyond doubt by Ferrier's experiments; and the fact is acknowledged by MM. Carville and Duret. In order to elucidate the question, these observers refer to the occurrence of movements in the opposite limb when the central end of the cut sciatic nerve is stimulated by electricity. Here, they say, the electric stimulus no doubt acts through the

medium of the gray centres in the spinal cord, substituting itself for the normal nervous stimulus; yet experiment seems to show that the gray matter of the cord is not *directly* excitable by electricity. Hence they argue that the nerve cell does not react except when excited through its corresponding nerve-tubule. So that the cells of the cortical gray matter may form only reflex or perceptive centres. In order to determine this question, they resorted to the old method of removing the portions of gray matter considered to be centres, and allowing the animals to live. In one of these experiments they carefully removed the centre for the extension of the fore and hind paws of a cat; and on electrization they obtained a repetition of the same movements as before. On the evening of the same day the animal had some difficulty in standing, and rested on the dorsum of the left forepaw and on the back of the claws of the hindpaw. In walking, the fore limb was thrown forwards, and allowed to fall in such a manner as partly to counteract the loss of power of the extensors, whilst the hind limb was dragged on the ground in a slightly flexed position. The animal often fell on to the left side. On the second day after the operation the loss of power of the extensors was much less marked; and by the fifth day they appeared to have recovered completely. A similar experiment on a dog led to a like result. Hence the authors conclude that the paralysis induced by removal of the so-called centres is only transitory. But, as Ferrier has shown, the paralysis differs in degree according as the movements are independent or associated with those of the opposite side; and he has observed that a mere degree of weakness may be produced by destruction of the centres for movements of the paw in dogs.

MM. Carville and Duret then examined, by means of sections made at various points, the course by which the impressions are conveyed to the deeper ganglia. They found that whilst section of the expansion of one cerebral peduncle at the level of or below the corpus striatum produced complete and permanent motor paralysis of the opposite limbs, and entirely prevented the occurrence of movements of the paws on excitation of the cortical centres, the almost complete removal of the intraventricular nucleus of the corpus striatum produced no effect on the excitability or the motor power. Hence they conclude that the currents pass downwards in the expansion of the peduncle, and act on the nuclei of the pons and medulla.

Lastly, they inquire what is the explanation of the speedy cure when only the cortical gray centre is removed. Referring to the theory of Brown-Séquard, which has been adopted by Ferrier, that the brain is a double organ, and that the uninjured hemisphere takes on the functions of the injured, they inquired by what system of fibres the supplementary action is effected. Three hypotheses present themselves: firstly, that fibres from the left hemisphere (if we suppose the right injured) pass across in the corpus callosum, and are either connected with the corpus striatum, or pass downwards in the right cerebral peduncle; or, secondly, that the fibres from the left hemisphere descend in the peduncle of the same side, and after their decussation act upon the nuclei in the right half of the medulla oblongata, and set up a corresponding action by lateral excitation in the nuclei in the left half; or, lastly, that the intra-ventricular nucleus of the injured side may act as a supplementary centre. The first hypothesis was negatived by the fact that complete section of the corpus callosum in a dog from which a cortical centre had been removed did not reproduce the paralysis after its cure, nor occasion any difficulty in walking. The second hypothesis seems improbable, from the fact that in cases of disease of the peduncular expansion in the corpus striatum the paralysis is permanent, and no supplementary action occurs. Hence they conclude that no such supplementary action of the sound hemisphere exists. The third hypothesis—namely, that the nucleus caudatus acts as a second centre for voluntary movements—seems to them to agree with the results of experience and of clinical observation; but, as they promise to communicate the results of further experiments on this point, it is unnecessary to enter upon it here. It is to be regretted that they should have limited their experiments to dogs and cats, but it is at the same time satisfactory to find that their main results confirm so strikingly those previously arrived at by Hitzig and Ferrier.—*Lancet*, Jan. 16, 1875.

They correct essentially H. & F.'s conclusions.

NOTES OF TRANSACTIONS AT THE NEW YORK MEDICAL SOCIETIES.

(2)

1875

To the Editor of the Philadelphia Medical Times:

SIR,—Among the matters of scientific medical interest recently occurring in our city may be mentioned the researches of certain gentlemen upon the cerebral centres.

Physiologists generally are aware that experimental researches have within a few years been made by Fritsch and Hitzig of Berlin, and Ferrier of London, with a view of proving the existence of, and of localizing, motor centres. Dr. George M. Beard, of this city, assisted by Dr. George B. Fowler, has also engaged in experiments upon the brains of living animals, having a threefold object in view,—namely, to ascertain how far the phenomena first observed by Hitzig and Fritsch, and subsequently by Ferrier, were demonstrable; 2, whether the objection of Dupuy and Canville to the conclusions derived from the German and English experimenters, on the ground that the current was diffused, was sound; 3, to push the inquiry still further, and by independent observation to settle, if possible, some of the questions suggested by the inquiry. The conclusions of Dr. Beard are—1. The living brain responds to electrical irritation, faradaic and galvanic. 2. There are in the brain certain different centres of motion, and probably of sensation. 3. The centres for the muscles of the mouth, neck, and legs appear to be in the anterior portions of the brain. The posterior portion is possibly the centre for special senses. Superficial irritation of the different parts of the cerebellum causes emprosthotonos; irritation of the tubercula quadrigemina causes opisthotonos; irritation of the hippocampi causes no visible reaction. 4. The brain in respect to these centres is symmetrical, and is indeed a double organ. 5. There is in the brain of a rabbit, in the posterior portion, about a quarter of an inch from the median line, a spot in each hemisphere that seems to be a centre for jumping and leaping movements.

with pulpit-orators, some favoring, some decrying it. In the same city a Cremation Society has been formed, and advertises in the *Athenæum*.

According to the *Medical Press and Circular*, a case of ante-mortem burial which occurred recently in France is about to become the subject of a judicial investigation, and will no doubt give a fresh impulse to the new movement. It is stated that about two years ago a young mother, shortly after the birth of her first child, was one evening seized with a fainting-fit, so severe as to be mistaken for death even by the physician, who, considering the great heat prevailing at the time, advised the inhumation of the body within six hours. This suggestion was unhappily adopted, but its frightful results only came to light the other day, when, the young widower having expressed his intention of marrying again, the mother of his dead wife claimed her daughter's body, intending to have it re-interred at Marseilles, where she resides. The vault was opened, and, to the grief and horror of all present, the coffin was found broken, and the corpse lying by its side, with hair and garments torn, and hands bitten through.

AS there are always persons ready to attach personal motives where they do not exist, and also to make personal applications where they are not meant, we want to state plainly that the Slowtown letters were admitted to our pages on the express understanding that they should not be personal attacks,—an understanding which, we think, has been carried out, at least so far as concerns the medical gentlemen connected with the canvass. The time seemed auspicious for calling attention to a source of grievous mischief, because the late very earnest, if not bitter, struggle had attracted general attenti

THE MONTHLY ABSTRACT
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Anatomy and Physiology.

On the Canals which are supposed to connect the Bloodvessels with the Lymphatics.

J. TARCHANOFF (*Archives de Physiologie*, July, 1875) reviews the opinions of Kölliker, Virchow, von Recklinghausen, and specially of Arnold upon the direct communication of the blood with the lymphatic vessels. He has injected the bloodvessels and lymphatics of the web of the frog's foot with Prussian blue solution, either alone or mixed with gelatine. Even after ligature of the veins of the limbs, followed as it is by œdema, the author's uniform result was that the injected mass was never found outside the walls of the vessels, unless there had been rupture of the walls of the vessels, when the mass spread itself between the interstices of the connective tissue outside. As to the injection of the corpuscles of the connective tissue by such a method, the author believes that such a view is quite untenable. He utterly denies the existence of a set of canals connecting the blood-vascular and lymphatic systems.—*London Med. Record*, Aug. 16, 1875.

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Experiments on the Brains of Monkeys, with especial Reference to the Localization of Sensory Centres in the Convolutions.

A paper on this subject by Dr. DAVID FERRIER, of London, was presented at the late meeting of the British Medical Association (*British Med. Journ.*, Aug. 28, 1875). The experiments on which the following conclusions are based were supplementary to those of the electrical irritation of the brains of monkeys, already published in the *Proceedings of the Royal Society*. They were recorded in detail in the Croonian Lecture read before the Royal Society in May last. In the absence of Dr. Ferrier, Dr. Lauder Brunton gave a brief summary of the main results. The method followed was the comparison of the effects of electrical irritation with those following localized destruction of parts of the brain by means of the actual cautery and scalpel. The two sets of experiments supported and explained each other. The most important fact demonstrated by this series of experiments was the localization of regions of special sense in the convolutions; and this, along with localization of centres of motion proper, served to clear up the true significance of the reactions to electrical stimulation. 1. Destruction of the frontal regions of the brain, which gives no reaction to electrical stimulation, is without effect on sensation or voluntary motion, but causes marked impairment of intelligence and of the faculty of attention. 2. Destruction of the gray matter of the convolutions bounding the fissure of Rolando causes paralysis of voluntary motion on the opposite side of the body, sensation remaining unaffected; while lesions circumscribed to areas, previously localized by the author, caused paralysis of voluntary motion limited to the muscular action excited by electrical stimulation of the same regions. 3. Destruction of the angular gyrus causes blindness of the opposite eye, the other senses and voluntary motion being unaffected. This blindness is only of temporary duration, provided the angular gyrus of the opposite hemisphere remains intact. When both are destroyed, the loss

of visual perception is total and permanent. 4. Destruction of the superior temporo-sphenoidal convolutions abolishes conscious reaction to auditory stimuli, the other senses and voluntary motion remaining unaffected. The results of destructiou, taken with the effects of electrical stimulation of this region, indicate that it is the centre of auditory perception. 5. Destruction of the hippocampus major and hippocampal convolution abolishes the sense of touch on the opposite side of the body. 6. Destruction of the *subiculum cornu ammonis*, taken with the results of electrical stimulation, indicates that this is the seat of the sense of smell for the same side of the body. 7. Destruction of the gray matter of the lower part of the temporo-sphenoidal lobe in immediate relation to the region of olfactory perception abolishes the sense of taste. 8. Destruction of the optic thalamus causes complete anæsthesia of the opposite side of the body. 9. Ablation of the occipital lobes produces no effect on the special senses or on the powers of voluntary motion, but is followed by a state of depression, with refusal of food, not to be accounted for by mere constitutional disturbance. In one case, which survived the operation for three weeks and was then killed, the appetite returned: a phenomenon probably to be accounted for by compensatory association. ~~The sexual appetite, however, was exhibited during the first few days after the operation, as judged by the behaviour of the animal to a companion monkey.~~ 10. Ablation both of frontal and occipital lobes in one monkey did not interfere with the powers of sensation or of voluntary motion.

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The Chemistry of the Blood.

In a recent communication to the Académie des Sciences, M. Gauthier describes a series of experiments on the influence of salt on the coagulation of the blood, an extension of the observations of Hewson, Davy, Dumas, etc. He found that the known effect in retarding coagulation was produced equally by chloride of potassium and by chloride of sodium, and that the maximum influence was obtained, in the case of the blood of the bullock, sheep, dog, and rabbit, when the proportion of the salt was 5 or 6 per cent. The retardation amounted to nearly twenty-four hours. A larger proportion had less effect. The corpuscles preserved their form, and even exhibited slight contraction, and, by simple filtration, could be separated from the plasma. The plasma could be preserved almost indefinitely as a clear liquid, coloured a slight rose tint. On the addition of water, which of course lessened the percentage of salt, it formed a firm and transparent coagulum. The plasma he found could be dried in a vacuum, and reduced to a grayish powder, which would redissolve in the same quantity of water, the resulting solution speedily coagulating on the addition of more water. The dried plasma did not lose its property by exposure for an hour to a temperature of 110° C.; its solution in water coagulated on dilution just as did the undried plasma. The coagulability of bullock's blood was unaffected, he found, by hydrocyanic acid, cyanide of potassium, arsenite of soda, strychnine, curara, or sulphuretted hydrogen; but the clot had less contractility, and yielded a smaller amount of serum, especially when arsenite of soda or cyanide of potassium has been added. M. Gauthier considers his experiments fatal to the idea that the coagulation of the blood is in any degree a vital act, a theory which had indeed already sufficiently vanished. He thinks that the red corpuscles yield to the serum carbonic acid, and that that is the determining cause of the coagulation. He does not appear to have made any special experiments to determine this point, which should easily be settled. The theory is hardly consistent with some of the known experimental facts.—*Lancet*, Aug. 7, 1875.

MISCELLANY.

THE LOCALIZATION OF SENSORY CENTRES IN THE BRAIN.—At a recent meeting of the British Medical Association, Dr. Brunton read a paper communicated by Dr. Ferrier, containing an "Abstract of Experiments on the Brains of Monkeys, with special reference to the Localization of Sensory Centres in the Convolutions." The experiments, which were conducted by trephining and the destruction of the sensory centres by means of a red-hot wire, led to the following results. These centres are bilateral, so that when one of the centres of touch was destroyed, there was loss of tactile sensibility in the corresponding half of the body. Stimulation of the centre of hearing caused the animal to prick up its ears as if it heard something, while destruction of the whole of this centre rendered the creature totally deaf. Destruction of the centre of vision corresponding to one eye (*e. g.*, the right) only rendered the animal temporarily blind in that eye, the function, after twenty-four hours, being carried on by the opposite centre. In the discussion that followed, Dr. Nairne pointed out that other observers had arrived at conclusions different from those of Dr. Ferrier, and that the brain of the monkey could not be taken as exactly similar to that of a man; but Dr. Brunton thought the mistake made by German and other investigators who differed from Dr. Ferrier was, that they took the brains of animals lower even than the monkey to correspond with that of man. M. Dupuy had arrived at different results. He said that he had found that when the centres of motion on one side of the brain were removed, paralysis followed for a short time throughout the corresponding part of the body, but that when the centres were removed from both sides of the brain there was no paralysis at all.

that in London, the proportion of illegitimate births in Paris was nearly 27 per cent., while in London it is only about 4 per cent. With regard to the mortality statistics, the annual Paris Bulletin contains information in far greater detail than the London Annual Summary. The rate of mortality is given for each of the twenty arrondissements and for each of the eighty quartiers into which Paris is divided. In the twenty arrondissements the death-rate in 1874 ranged from 15 per 1000 to 27. It is somewhat remarkable that in the arrondissement in which the density of population is greatest in Paris—namely, more than 300 persons per acre—the death-rate did not in 1874 exceed 16 per 1000. London figures show a very different result.—*London Lancet.*

CULTIVATION OF NUTMEGS IN JAMAICA.—According to Mr. R. Thompson, Colonial Botanist, Jamaica (*Journal of Applied Science*), the cultivation of the nutmeg-tree is very successfully carried on on that island. A number of plants have been supplied, and about two thousand are now under propagation at the Bath Gardens, and will shortly be ready for distribution. A fine nutmeg-tree growing in the vicinity has a crop of about four thousand unusually large fruits. At present prices, this quantity—calculating ninety nuts to the pound—will realize about twenty-two dollars. However, this crop appears to be considerably above the average, as five dollars is the usual value of the annual produce of one tree. The nutmeg begins to bear about the seventh year, and the price of the fruit depends largely on the size, or number to the pound. Large nutmegs count about eighty to the pound.—*Canada Pharm. Journal.*

A HEAVY DOSE OF MERCURY.—"A few days ago," says the Gilroy (Cal.) *Advocate*, "Mrs. Anna Babb's little boy drank a pound of quicksilver. The child is

At the Berlin Medico-Psychological Society in November last, says the *Medical Times and Gazette*, Dr. Hitzig, the author of the method of examination of the brain by electricity, made some remarks on Dr. Ferrier's well-known experiments on the localised functions of the brain, especially with regard to the discrepancies between his own and the latter's results. He considers that the chief of these is that while he and Fritsch have found only one part of the convexity of the hemispheres capable of electrical excitation, Ferrier extends this property to nearly the whole of it. This Hitzig explains by saying that Ferrier has in his experiments used two strong currents (the secondary

trees of the various groups of both plants and animals, by Prof. Ernst Haeckel of Jena. "The New Chemistry," by Prof. Josiah P. Cooke, of Harvard University, with numerous illustrations.

MESSRS. WM. BLACKWOOD AND SONS have in the press the following works relating to natural science:—An "Advanced Text-book of Botany for the Use of Students," by Robert Brown, F.R.G.S., Lecturer on Botany under the Science and Art Department of the Committee of the Privy Council on Education and author of the "Races of Mankind," just published by Messrs. Cassell, Petter, and Galpin; "Domestic Horticulture,

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coil of Stohrer's battery being pushed into eight and even four centimetres), and has thus excited the ganglia at the base of the brain, so that it is to them, and not to centres localised in the cortex, that the movements noted must be referred. Another reason why Hitzig doubts some of the effects of irritation in Dr. Ferrier's cases is because, although there is such a remarkable similarity between the brains of the dog and the cat, the latter found that electrisation of the spot on the cat's brain corresponding to the centre of movement for the tail in the dog gave no result. Hitzig has repeated several of the experiments in which Ferrier's results differed from his own, and declares that his own views are re-confirmed. He will shortly publish a detailed account of all his work in Du Bois-Reymond's *Archiv.*

President of the Society, occupied the chair and opened the proceedings by reading a paper on "Local Scientific Societies; their aims and objects;" in which he pointed out the importance of the study of natural science, both as in itself a valuable branch of education, and as a means of intellectual discipline. This was followed by a discussion on the "Relations of Physico-Geographical Conditions to Civilisation." The "Londonderry Scientific Society" is chiefly composed of ex-members of the "Londonderry Natural History and Philosophical Society," which ceased to exist some two years ago.

WE learn from Mr. Gerard Krefft, F.L.S., Curator of the Australian Museum at Sydney, that the museum, which is the

A PUZZLE FOR THE FACULTY.

The Facts in the Case of Mr. Robert A. Hall.

On Tuesday week Mr. R. A. Hall, of the firm of Hall & Pratt, book and stationery dealers in this city, near six o'clock on the above named evening, complained of a severe pain in the head, and left for his residence. Soon after he was taken with violent spasms, and they followed each other in quick succession until, ten o'clock, when he went to sleep and rested quietly until morning. When he awoke, a remarkable gap in his memory had taken place, and three years of an active life were blotted out.

To explain, and give the reader an intelligent understanding of this, it is necessary for us to state that nearly three years ago Mr. Hall, while living in Elmira, met with an accident. He struck his head against a beam in his barn, fell senseless to the floor, and lay unconscious for some time. He recovered without present serious consequences, and the matter was forgotten, until a few days ago, when taken sick. This will explain the strange story we have to relate, which, while it has its parallel cases in medical jurisprudence, still they are of infrequent occurrence. Mr. Hall awoke on the morning after his sudden illness without the power to recognize any member of his family, except his wife; all that had occurred from the moment he sustained the accident at Elmira was a blank. He first recognized his wife, and on the Friday following his illness, called Mr, Pratt by name, and asked him when he left his school, his recollection of Mr. Pratt being that he was still principal of the Academy at Danville, Pa. Since that time he has slowly recovered his bodily health, and his mind is clear and distinct in relation to everything connected with his life and business previous to the accident, and subsequent to the morning following his attack. His brothers came on and endeavored to revive his memory by the relation of facts that had transpired at his old home. Deaths were mentioned and other incidents, but Mr. Hall had no recollection of them, and he stated his surprise that he had not heard of them before.

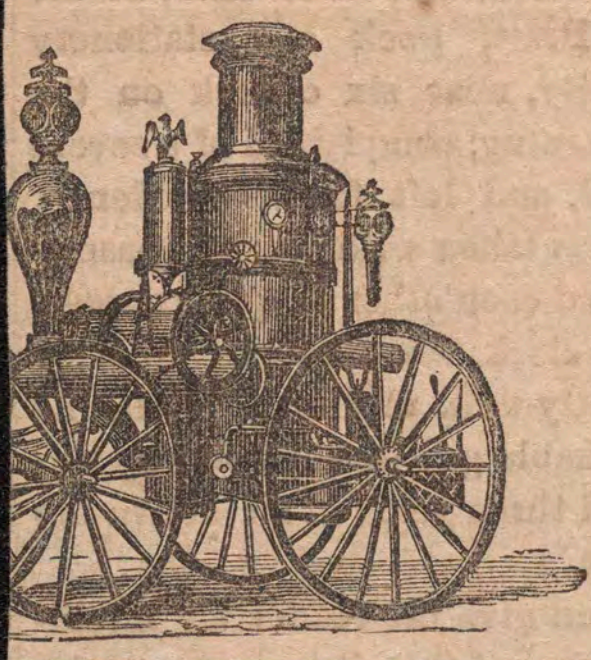
His two youngest children are strangers, and a little girl some five or six years of age he remembers as a small girl. Yesterday he was able to ride out, and was taken over the city in hopes that familiar places would revive the dormant powers of memory. He visited the store, but was a stranger to all its inmates. He read the names on the sign, and recognized his own. He also was highly pleased with the location of the store and the general business arrangements, but the fact that he had ever been a part of the establishment was a truth to him unknown.

We do not profess to know the agency of this subtle disease that has been working on his brain for three years, and finally culminating in the total loss of memory, dating from the moment of the accident to his brain three years ago, but the fact is true, that such is the case.

Mr. Hall, in company with his friends, left the city this afternoon for his old home, in Elmira, in the hope that the old time-associations may have a tendency to revive and bring back the abnormal condition of his mind, and fully restore him to health.

The best wishes of Mr. Hall's friends in this city will go with him, coupled with the hope that he will soon be fully restored to his family, business and society, which he so eminently adorns.—*Scranton Democrat.*

IRON WORK



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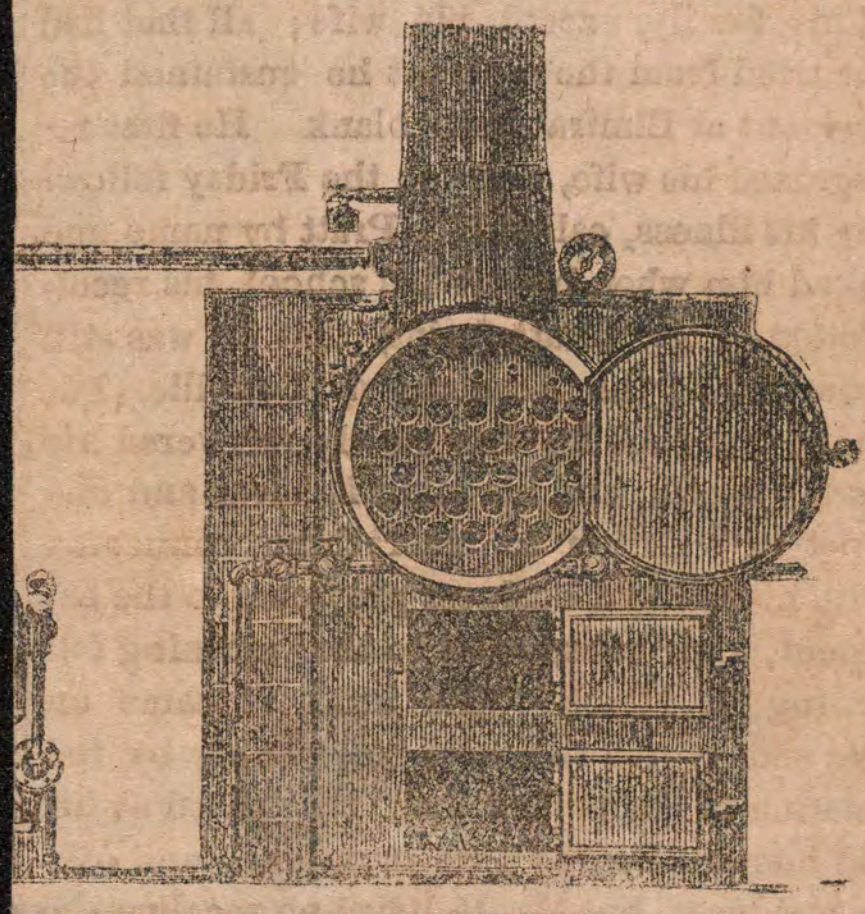

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l supervision, to make

* Lower animals have no true will.
(Bain & Maudsley deny it to man also).—

Types of Character (Carpenter).

Alfieri

Rossini — Burns —
"Just skilled to —"
Byron, Mazeppa

Automatic man in France — 1874 —

† Examples — hunting for a word — waking at a certain hour —
night & morning occasions —
Composition —

Unconscious emotional cerebration —
(novel-plots!)

Transmission of mental (cerebral) traits: instincts & intuitive ideas.

Table-turning! Explanation: Faraday.

Prof. Hare's spiritualism! Katie King!

Hartford – 9/22/74

Instinct – Spaldy – chicks, & pigs –

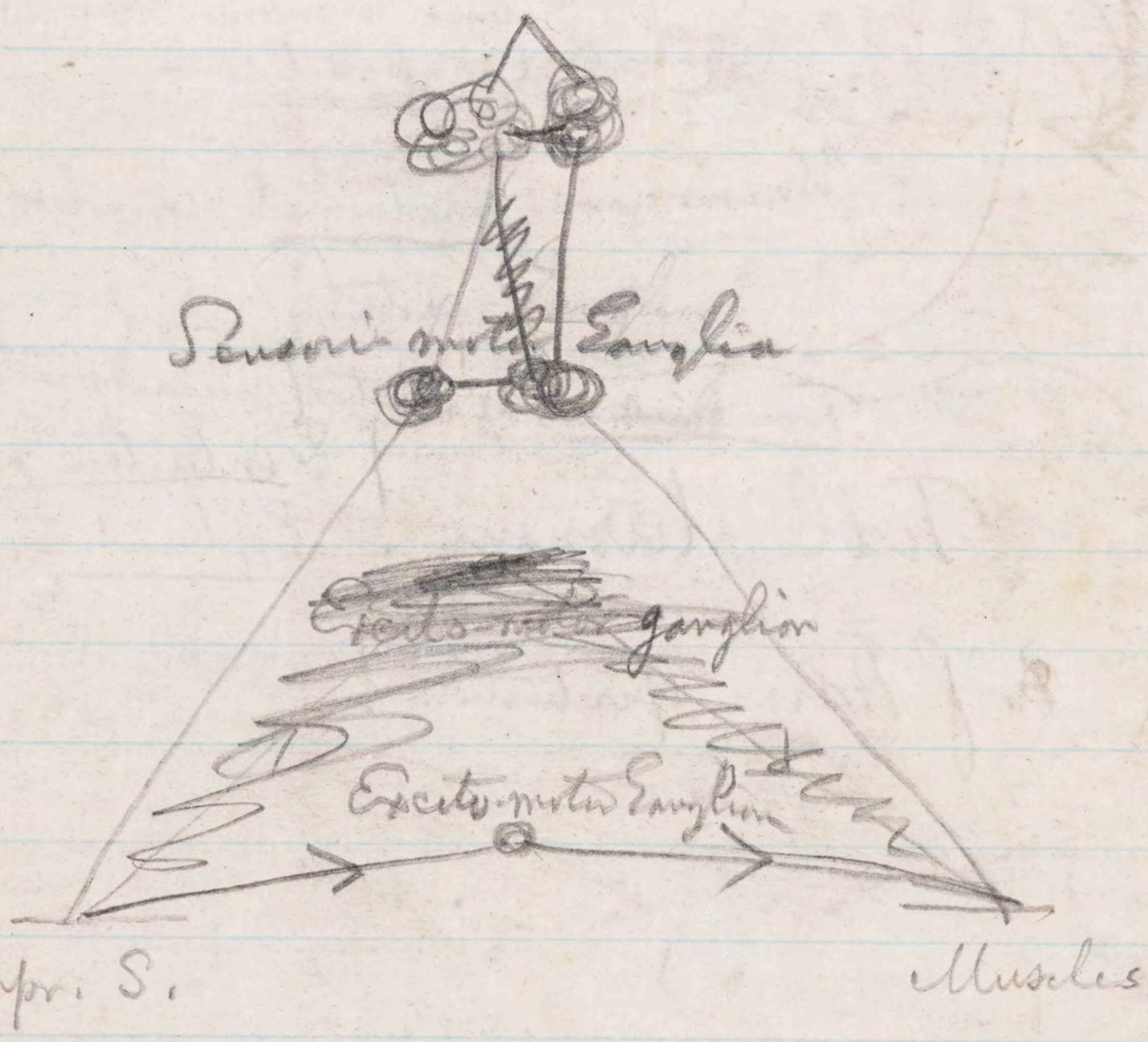
Infant sucking –

Dominant

Automatic man

Mozart, Colombe, Rossini –

Phrenology – well



[Lucid — 1874 —
Sleep — Somnambulism — Coma —]

B

23

Sensation:
Touch
Taste
Smell
Hearing

[Dr Flash
Anesthetic Elements
Medium]

Lowest animals only touch =

sense of vibrations —

Temperature

ORGANS OF SENSATION.

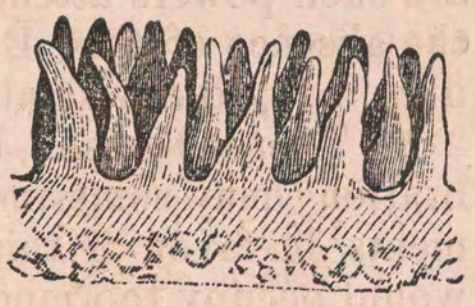
For the perception of an impression made upon any part of the body, three things are required: an organ or surface to receive the impression, a nerve to convey it, and a sensorial ganglion in the brain to perceive it. It is also requisite that *attention* be given to the sensation; as many impressions, especially if they be slight, may be made upon our organs, while the mind is strongly preoccupied, without our taking any cognizance of them.

Touch.

This is the simplest and most extensively diffused of all the senses; being sometimes, therefore, called *common sensation.* All the superficial parts of the body, and the inlets and outlets of the cavities, are endowed with it, in different degrees. The deeply-seated organs are not possessed of sensibility, although uneasiness and pain result from diseased conditions affecting them.

Susceptibility to *pain* appears to be a different thing from the simple sense

Fig. 148.

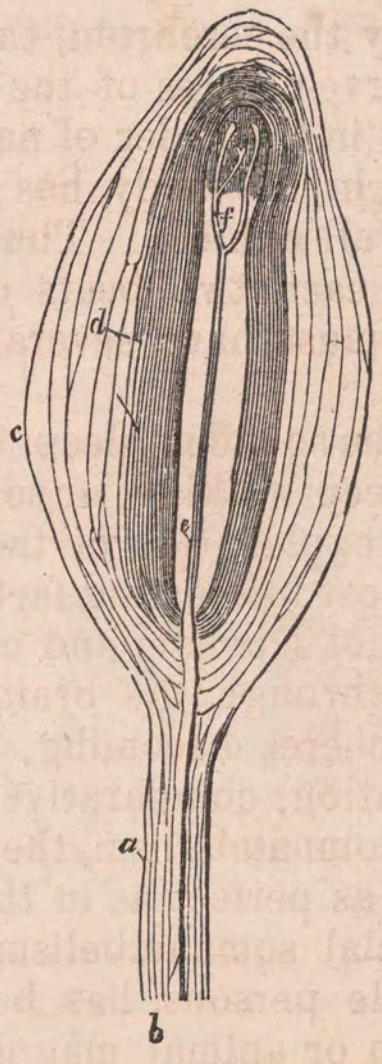


PAPILLÆ OF PALM.

Fig. 149.

PACINIAN CORPUSCLES.—Portion of digital nerve.

Fig. 150.



PACINIAN CORPUSCLE.—*a.* Peduncle. *b.* Nerve-fibre. *e.* Axis-cylinder. *f.* Subdivision of same. *c, d.* Laminated sheath.

also on the sympathetic branches near the aorta, — and on the nerves of the mesentery.

of touch. Anæsthetic inhalation (as of ether, nitrous oxide, or chloroform) may prevent, sometimes, the pain of an operation, while the patient feels every movement made.

The special organs of touch are the *papillæ tactus.* They are little irregularly conical projections, seen in rows, with wrinkles between them, especially upon the hands. Each papilla contains a (looped ?) termination of a nerve-filament, and a loop of capillary bloodvessels. ~~Only~~ On the digital nerves (of the fingers and toes), are the minute fibrous *Pacinian corpuscles* found.

By pressing the points of a pair of compasses, tipped with cork, upon the skin, it may be shown that it is only when they are at a certain distance from each other that they are felt as two instead of one object. As the distance needed for their separate perception is different on different parts of the body, the comparative sensitiveness of each may thus be measured. The following table exhibits the results of such experimentation (Weber, Valentin) :—

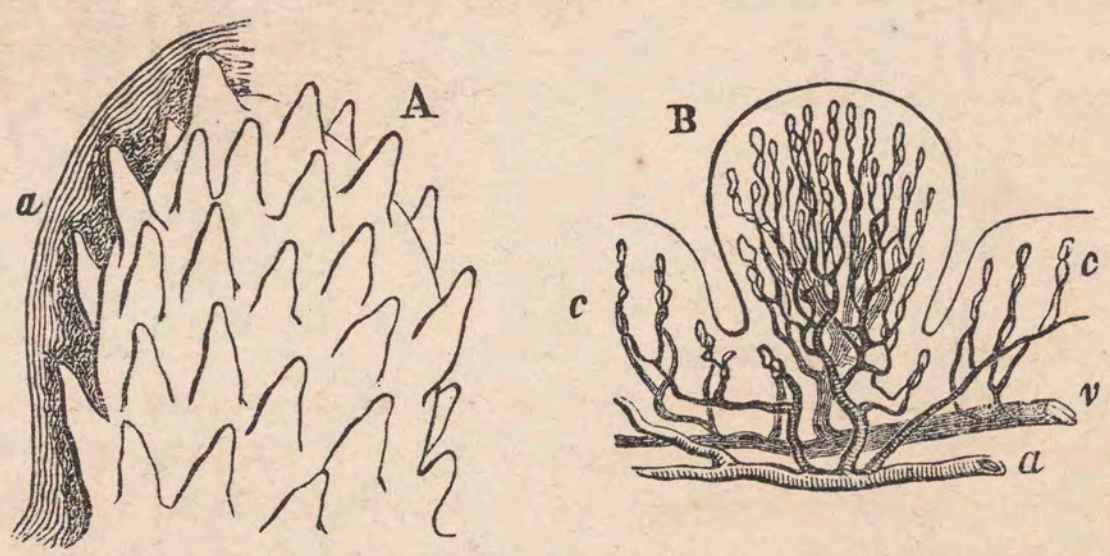
Point of tongue,	½ line	Lower forehead,	10 lines.
Tip of forefinger,	1 "	Skin of occiput,	12 "
Red surface of lips,	2 lines	Back of hand,	14 "
Palm of hand,	5 "	Skin of back,	30 "
Skin of cheek,	5 "	Middle of arm,	30 "
End of great toe,	5 "	Outside of thigh,	30 "

The term *anæsthesia* is applied to any loss of sensibility, local or general, however produced. Not unfrequently it occurs as a form of *paralysis* or palsy.

Taste.

The tongue, and, to a less degree, the soft palate, are the seats of this sense. The nerves connected with it are, for the tip or

Fig. 151.



FUNGIFORM PAPILLÆ OF TONGUE.—A. Papilla, with secondary papillæ. *a.* Epithelium. B. Papilla with capillaries injected.

end of the tongue, the lingual branch of the inferior maxillary of the 5th pair, and the lingual branch of the glosso-pharyngeal (8th.)

Over the tongue are scattered numerous papillæ (see *Anatomy*),

Glossopharyngeal?

for the root & sides of tongue, & palate,

THE length of time needed for reaction in sensation has been made a subject of investigation by two German physiologists, Vintschgau and Hongschmied, with the following results: In the case of a person whose sense of taste was highly developed, the reaction-time was, for common salt, 0.159 second; for sugar, 0.1639 second; for acid, 0.1676 second; and for quinine, 0.2351 second. With a person whose taste was less acute the reaction-times were 0.595 second for salt, 0.752 second for sugar, and 0.993 second for quinine. It will be seen that in both instances for the bitter taste of quinine the reaction-time was considerably longer than for the others.

A CLUB has lately been formed in this country for the circulation among its members, by way of the United States mails, of microscopic objects. Applications for membership should be made to the secretary of the club, Rev. A. B. Hervey, 10 North Second Street, Troy, N. Y. Those only are eligible as members who are accustomed to work with the microscope, and who can contribute to the usefulness of the club by sending good objects for examination.

AT the Louisville meeting of the American Medical Association, S. D. Gross, M. D., of Philadelphia, avowed himself an advocate of bloodletting for many diseases, especial-

simple, filiform, fungiform, and circumvallate. Each of these, like the papillæ tactûs, contains the end of a nerve and a loop of capillaries. For taste, it is necessary that particles of a sapid substance come in *contact* with the tongue in a state of *solution.* Unless the tongue is morbidly dry, the saliva will suffice to moisten sufficiently an otherwise dry material. A sensation of taste may be produced by a galvanic current; as in the familiar experiment of placing a silver coin under the tongue, and a copper one upon it, so that they touch beyond the end of the tongue.

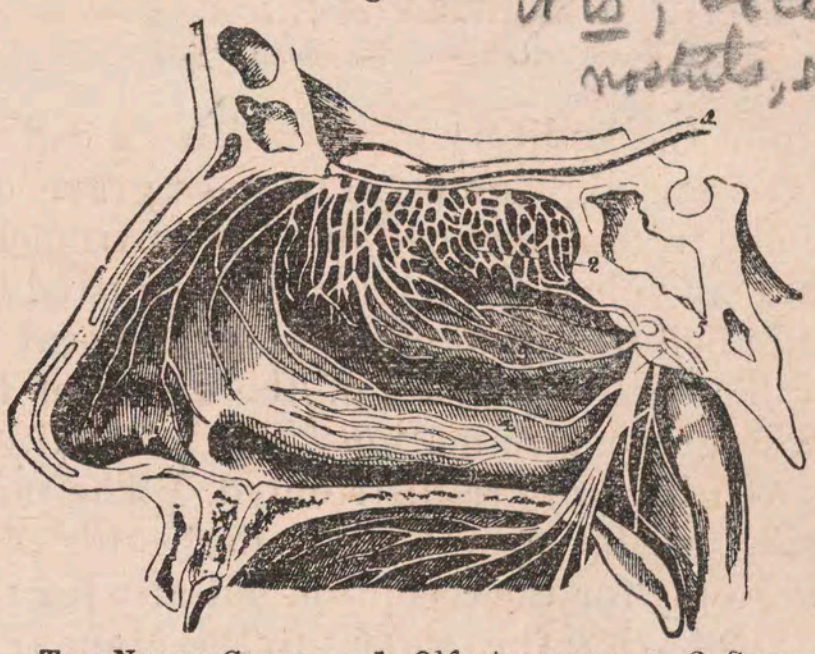
Impressions of taste are considerably heightened or modified by the simultaneous perception of odor in the same substance. Taste may be cultivated, as in wine-tasters and tea-tasters, to a high degree of delicacy.

The *use* of the sense of taste evidently is, not only to give pleasure in eating and drinking, but to guide in the selection of food. Among *natural* products, it is a generally sufficient guide. Of course artificial substances may, and frequently do, combine pleasantness of taste with poisonous qualities.

Smell.

The seat of this sense is the upper part of the lining membrane of the nasal cavities; receiving the distribution of the terminations of the olfactory nerve. As in the case of taste, actual *contact* of odorous particles is necessary; but these particles may be extremely minute or subtle in diffusion. Thus a small piece of musk may give an odor to a very large apartment. A drop of creasote upon a table may leave a perceptible smell after repeated washings; and it seems sometimes almost impossible to wash the scent of the dissecting room from the hands. Most remarkable, however, is the power of certain animals to detect and pursue their prey by the scent, as the hound does the fox or hare, even while running at full speed. The delicacy of sensitiveness to impressions required for this is almost inconceivable.

Fig. 152.



THE NASAL CAVITY.—1. Olfactory nerve. 2. Superior turbinated bone. 3. Middle bone. 4. Inferior bone. 5. Fifth nerve.

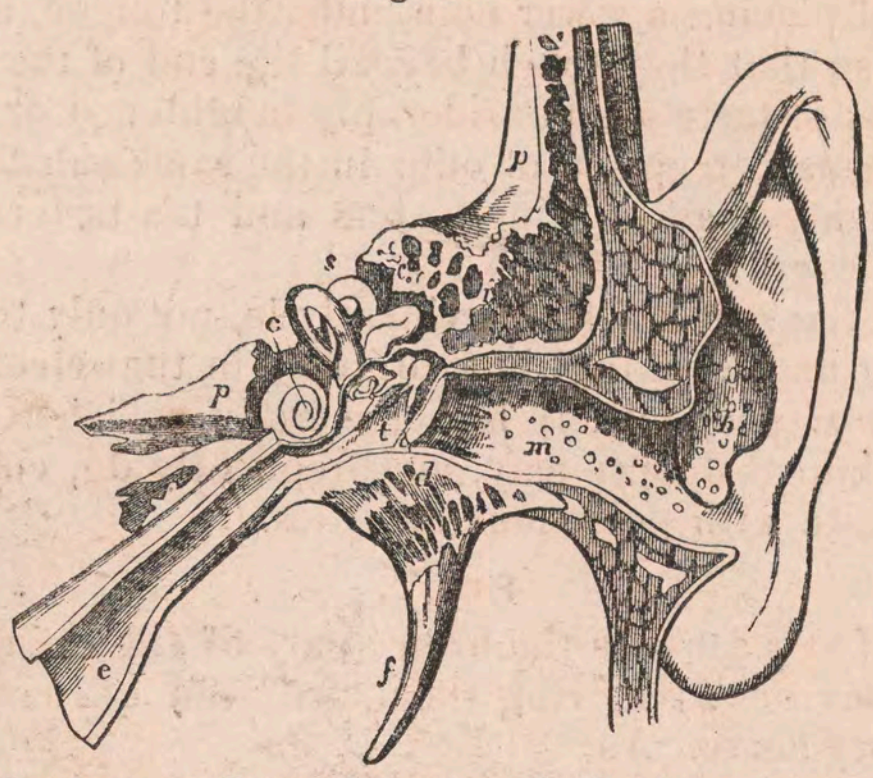
Among animals, to find their prey, or mates, is evidently a principal use of the organ of smell. We find it also capable of another service, in making known the presence of things which contaminate the air and make it insalubrious. All ordinary causes

of atmospheric impurity, and consequently of ill health, are offensive to us.

Hearing.

Vibrations of sonorous bodies induce waves of air or of other media, which, impinging upon the ear, produce the impression

Fig. 153.



THE EAR.—*b.* Concha. *m.* External meatus. *d.* Membrana tympani. *t.* Cavity of tympanum. *e.* Eustachian tube. *i.* Mastoid cells. *s.* Semicircular canals. *c.* Cochlea. *p.* Petrous portion of temporal bone. *f.* Styloid process.

upon the auditory nerve which we call sound. Rapid undulations produce high notes, slow ones grave or low notes; whether they come from a stringed or wind instrument, a bell that is struck, or a human voice. In a receiver exhausted by the air-pump, the ringing of a bell will produce no sound; because there is no air to vibrate.

The essential part of the organ of hearing is the *internal ear*, where the terminations of the auditory nerve (portio mollis of seventh pair) are distributed. The *middle* and *external* ear, however, are important to the perfection of the organ as an instrument not only for the reception but also for the discrimination of sounds.

Referring the student to the Manual of Anatomy for the description of the structure of the ear, no more will be repeated here than is absolutely necessary to make our language intelligible.

External Ear.—Many animals have their ears movable in different directions, so as to receive sounds from various quarters more distinctly. Man, although possessing *rudimentary* (undeveloped) motor muscles of the ear, has not that power. Instead, the external ear is curiously curved and excavated; thus presenting a number of surfaces in different directions. The total result of these curves and channels is, the concentration or pouring of the aërial waves and reflections, as through a funnel, into the *external meatus.*

This passage ends in the *membrana tympani.* At its outer

Sound (see Tyndall).

Sound does not pass through a vacuum

Through air at freezing point of water,

1090 ft per second; at 60° to 70° F.,

1120 — 1140 ft. per second.

more than
4 times as fast through water

10 " " " " pine wood

17 " " " iron

Because of greater relative elasticity of solids.

Sound is reflected, refracted, and may be (through a collodion balloon filled with CO_2) condensed to a focus.

② [1876, 2nd lecture]

Echoes are reflections of Sound.

(Echo Lake, Wh. Mts — Wetterhorn & Jungfrau, Switz
reputed echoes)

Sonorous wave of air, 2 parts; condensed & expanded

Dense string, pulled or a column of air in a tube, &c, may vibrate as a whole or in equal divisions: the latter, harmonics. Mingling of fundamental (whole) tone with " " gives overtones. Same is true of a column of air in a flute or other instrument. — ⊗ p. 3

Amplitude of sound-waves determines intensity of sound.

Rapidity of waves (no. in a second) is pitch.

Length of air-wave sound by man's voice, 8 to 12 feet; woman's, 2 to 4 ft.; woman's voice pitch 1 to 2 octaves higher than man's.

Musical sounds periodical, at sufficiently short intervals. Ear, lute with 3000 strings.

Octave means range between a fundamental note and that produced by twice as many vibrations.

Human ear sensitive to 11 octaves; from 16 vibrations in a second to 38000. (Helmholtz).

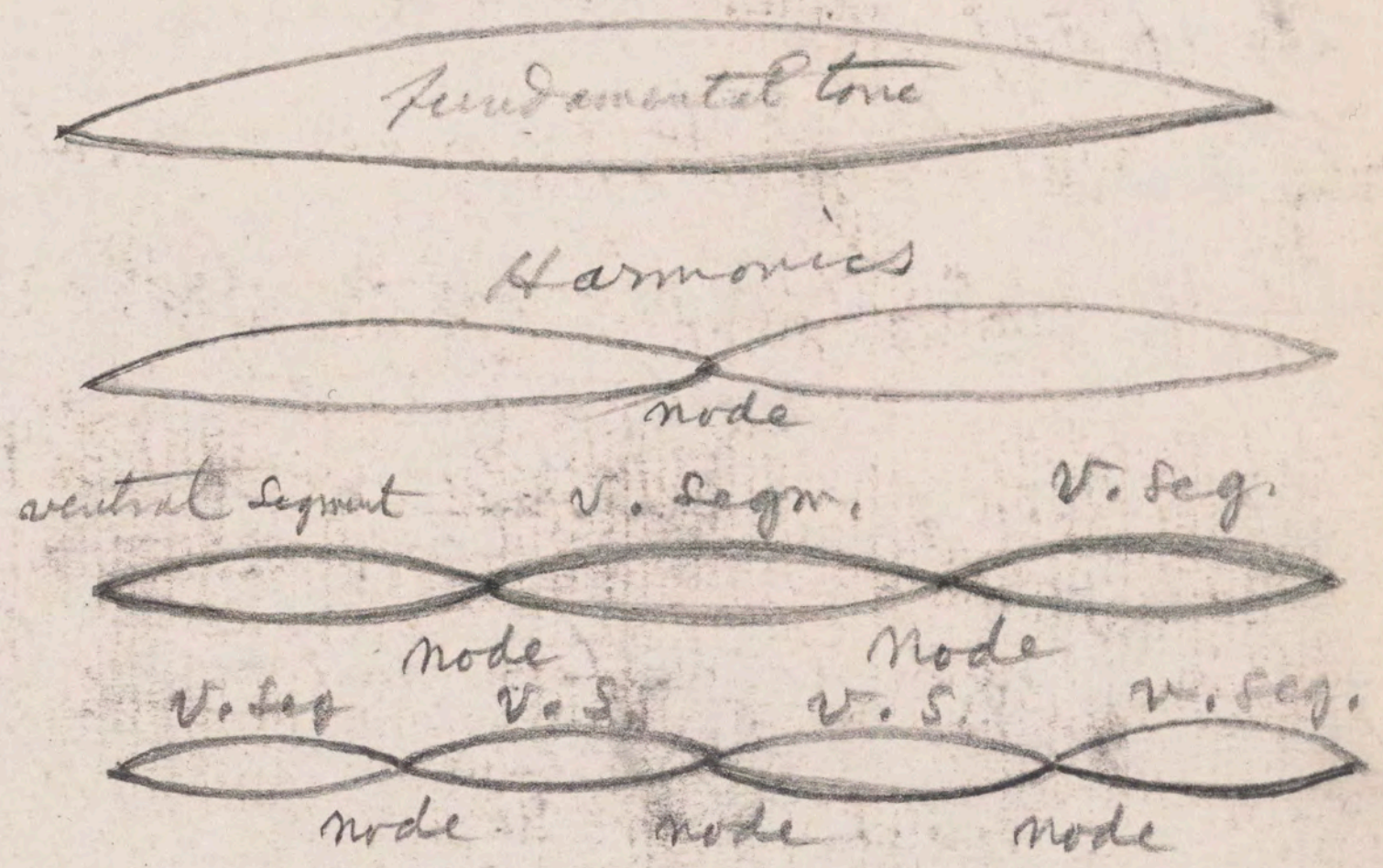
(1 1876) Light travels much faster than sound; e.g. lightning & thunder — gun & flash — axe falling & sound, — according to distance. (2 p. 1)

Tube conveys sound far: iron pipe, 3000 ft.

Some rooms — Concave roof of a cathedral in Italy, over confessional. Whispering galleries.

II Resonance: Spouting horn, Newport — fall of Reuss at Devil's Bridge in Switzerland; others in Ireland &c.

On approach of railway train whistle has pitch heightened; on retreat, lowered; 1st by shortening, 2nd by lengthening time of waves.



⊗ Difference between instruments, & voices, made (timbre) by the overtones.

Differences among vowel-sounds, ditto. II p. 2

Experiments in resonance; Shell to ear, poker held by two strings, fingers in two ears, - poker struck against wood.

External ear resonates or resounds to some vibrations. Mouth resounds in speaking &c.

(3) Tyndall:

"In the music of an orchestra, not only have we the fundamental tones of every pipe and of every string, but we have the overtones of each; also resultant tones, of difference and summation; all transmitting through the same air, all knocking at the self same tympanic membrane. We have fundamental tone interfering with fundamental tone; overtone interfering with overtone; resultant tone with resultant tone. And besides this, we have the members of each class interfering with the members of every other class. The imagination retires baffled from any attempt to realize the physical condition of the atmosphere through which these sounds are passing."

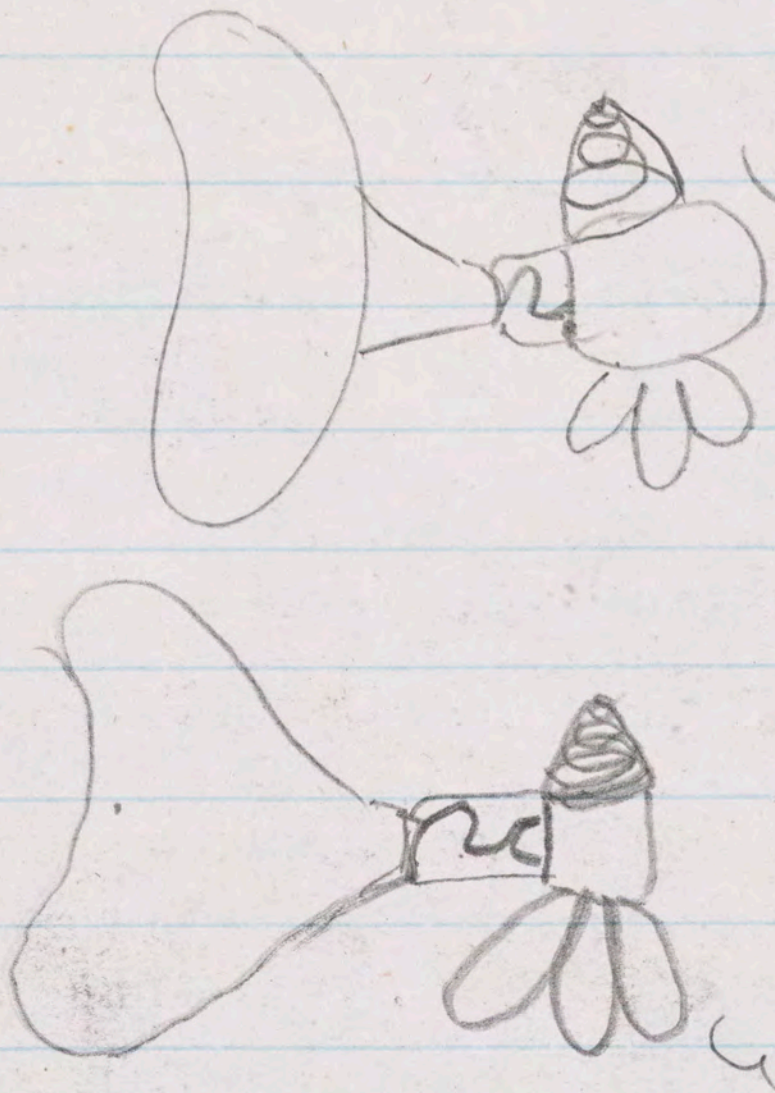
Reading: omnibus by Tyndall

---

(1) Interference occurs when equal waves meet each other in opposite phases — annulling sound of both.

(2) Communication of vibration: two clocks; Davy's lamp; tuning forks; certain tones of voice making glass ring; certain note of organ breaking pane of window.

Tim Barnum



Experiments with sound: (Tyndall)
lighting Davy's lamp in gas with sound;
tuning fork (not audible) commun. sound to
another reading on a resonant support!

Overtones

Some animals only the internal ear, & this not enclosed & specialized as ours is.

External ear (absent in birds, moles & fishes &c) regarded as reducers & makers

Some, very imperfect

(Circ. - 1874 -
Statistical Inquiries Circular
Miscellaneous)

B

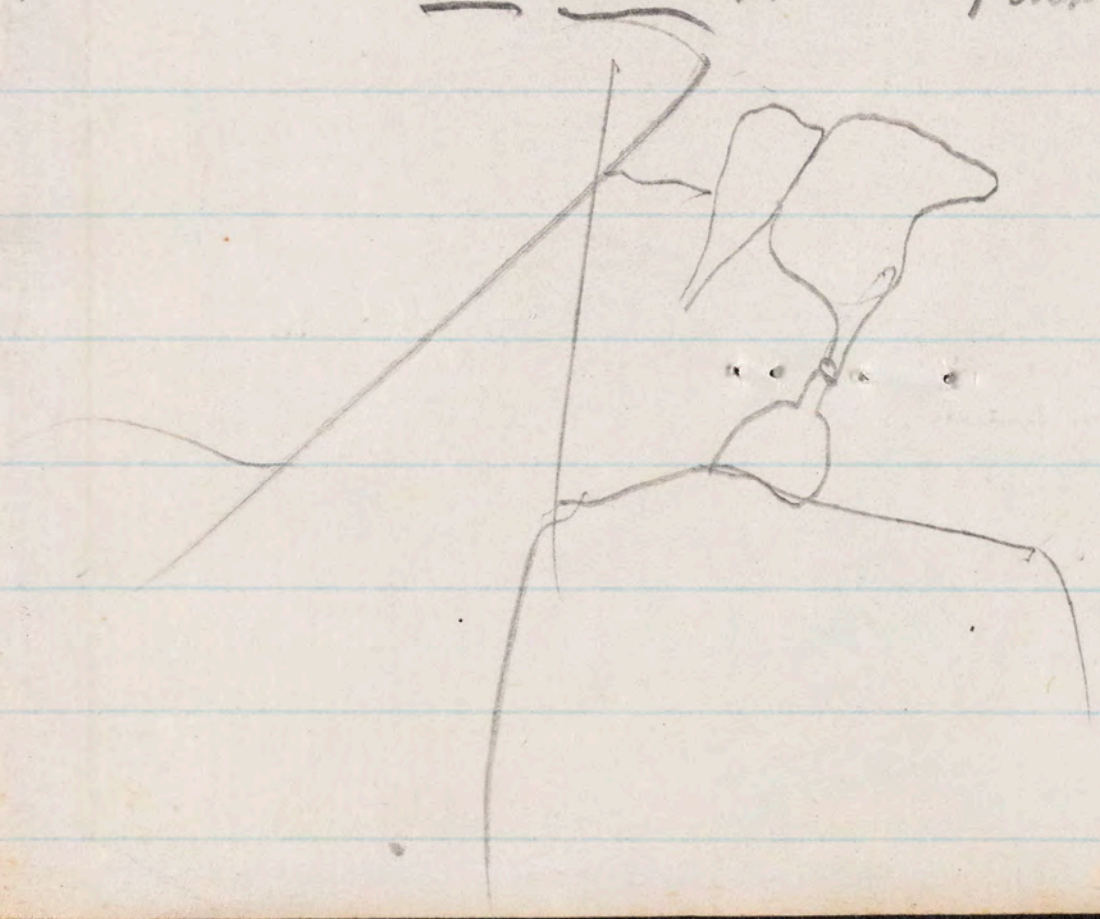
24

Hearing
Vision

Ear of mouse, &
of bat, — found to be (externally)
wonderfully endowed with tactile nerves.

Stapedius probably compresses the
contents of the vestibule.

Deafness to sounds of certain pitch —
Omnibus — hearing —
must not be too tense however; that dulls hearing.



At 10 o'clock P.M. the Society re-assembled in the Lowell Institute to listen to a paper by Dr. C. J. Blake, of Boston, on "A New Use of the Membrana Tympani." The paper was illustrated with illuminated photographs by means of Black's stereopticon. A preparation of the ear was shown, in which the membrana tympani had been exposed, and styles attached to the handle of the malleus and the point of the incus. When the membrana tympani was set in vibration by a sound, the style traced a waved line on a bit of smoked glass. The curves formed by different vowel-sounds and by different musical notes were perfectly distinct from each other in character, and each sound had its own particular curve.

hours; he also took ten drops of deodorized tincture of opium four times daily.

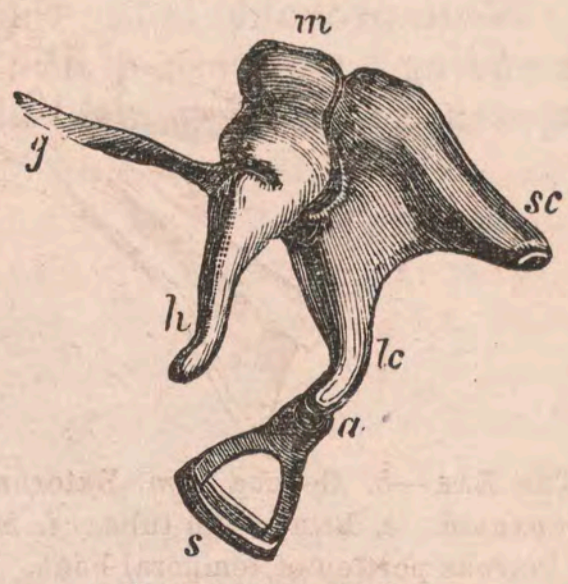
He then steadily grew worse, until his condition appeared hopeless. Quinine, stimulants, and animal broths were administered, and the opium and acid mixture were discontinued. He slowly rallied, and was placed on one drachm of the fluid extract of valerian four times daily. The general condition again improved, and on November 17 he passed 195 ounces of urine of the specific gravity of 1006.

A searching examination was then made of the viscera and nervous system, but the seat of the lesion could not be discovered. The pulse was 84; the respiration varied between 18 and 24. The temperature of the body was 97.5°. It had at no time been higher than 99°, and had repeatedly fallen to 97°, with an evening exacerbation of half a degree, or very occasionally of one degree. A half-ounce of cod-liver oil thrice daily

orifice are a number of hairs. Its lining tegument secretes, by follicles, the *cerumen* or wax of the ear. The purpose of this wax, whose odor is unpleasant, seems to be, to exclude insects and animalcules. The meatus is endowed with delicate sensibility. Probably we may be aided in determining the *direction* of sounds, by the mechanical impression of air-waves, when sound is most intense, upon its surface. The loss of the external ear lessens distinctness of hearing, but does not cause deafness.

Middle Ear, or Tympanum.—This is a cavity in the temporal bone, bounded on the outside by the *membrana tympani*, and within by the vestibule and part of the cochlea of the internal ear. It communicates with the upper part of the pharynx by the Eustachian tube. Within it, surrounded by air, is the chain of *ossicles*, the *malleus*, *incus*, *orbiculare*, and *stapes;* which connect the membrana tympani with the membrane of the foramen ovale (fenestra ovalis) of the vestibule. These little bones having a slight motion upon each other, three muscles affect their condition and the tension or relaxation of the tympanic membrane; the *tensor tympani*, *laxator tympani*, and *stapedius*.

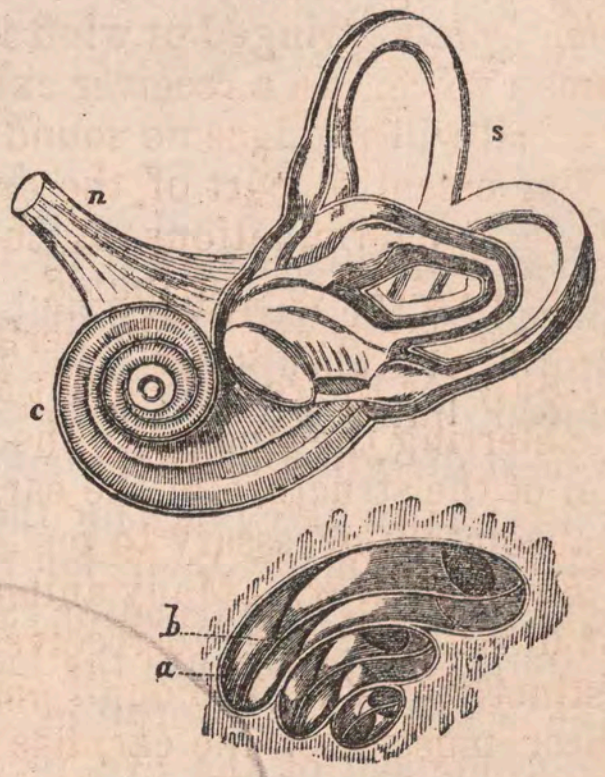
Fig. 154.



OSSICLES OF THE EAR.

The tympanum is, essentially, a drum. It is not air-tight, because, by the Eustachian tube, air is admitted into it. The use of this seems to be, that sonorous waves, impinging upon the membrana tympani from without, through the meatus, may be to a sufficient extent *balanced* within. Violent effects are thus provided against.

Fig. 155.



LABYRINTH OF THE EAR.—*n*. Auditory nerve. *s*. Semicircular canals. *c*. Cochlea. *a*. Osseous wall of the spiral tube of the cochlea. *b*. Spiral staircase.

Internal Ear, or Labyrinth.—Again referring to *Anatomy* for description, we may call attention only to the facts, that the vestibule, cochlea, and semicircular canals contain fluid, and that within them are spread out the terminations of the auditory nerve. The vestibule communicates with the membrana tympani by the chain of ossicles. The cochlea has a foramen, the *foramen rotundum*, or *fenestra*

vestibule near the

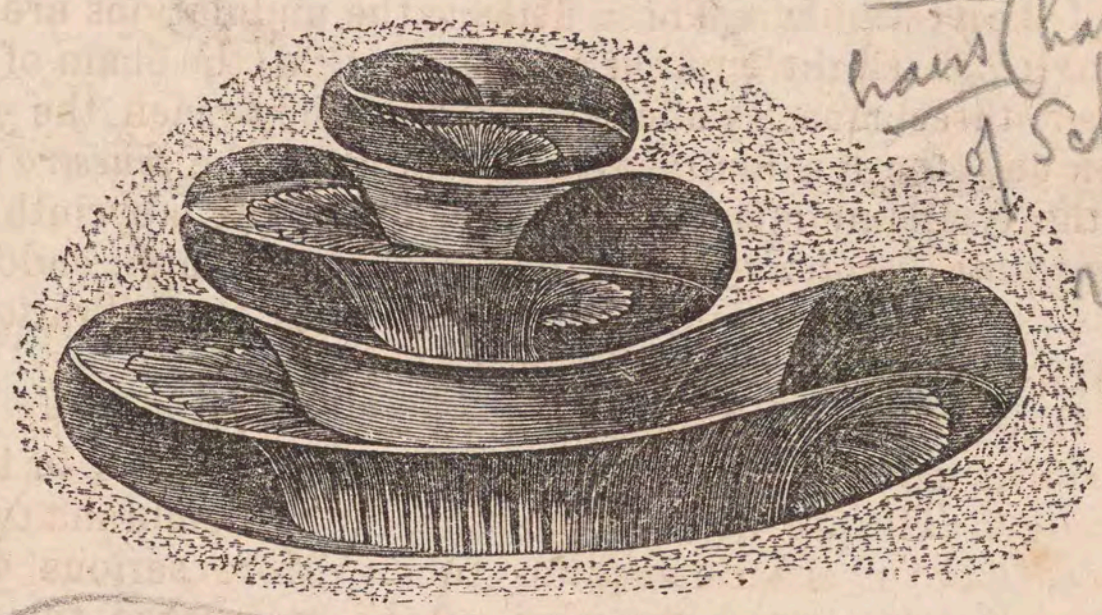
auditory Hairs or bristles of Schultze Hair-cells

rotunda, opening upon the cavity of the tympanum, but covered with membrane. Within the vestibule, also, are the *otoconia* or *otoliths*, minute calcareous crystals; whose whole use must be supposed to be, by their vibrations, to reinforce feeble impulses of sound and make them more appreciable.

The uses of the spiral shape and double "staircase" of the cochlea, and those of the three differently placed semicircular canals, are not yet known. The idea that the canals may serve to enable us to determine the *direction* of the origin of sounds (a not uncommon conjecture) is excluded by the fact that almost all sonorous vibrations enter by the *meatus externus*, and, after striking upon the *membrana tympani*, have thereafter the same direction, whatever their origin.

More probable is the theory that the spiral "ascending and descending" staircase of the cochlea (communicating by a minute aperture at the *humulus*) allows of the *roll* of every distinct wave

Fig. 156.



THE COCHLEA.

of sound, intensifying it by the condensation and rarefaction produced by the narrowing and subsequent expansion of the double spiral; no abrupt arrest or rebound of the wave being thus produced, but a gradual exhaustion of it. The rounded form and varied direction of the semicircular canals suggest an analogous purpose; to give place for the escape and dying out of undulations which have made their impression upon the auditory nerve, and which, if they returned or reverberated in the vestibule and tympanum, would confuse the hearing. This has been compared with the arrest or "absorption," by the black pigment layer of the choroid coat of the eye, of rays of light which have made their impression upon the retina. ~~Probably the cochlea may also afford the means of determining the *pitch* of sounds.~~

Transmission of Sound.—Sonorous vibrations move through the *air* at the rate of somewhat more than 1100 (1118–1142) feet

in a second; through *water*, 4900 feet in a second; through solid bodies, much more rapidly, according to their density. When such waves are transmitted by contact from one body to another, some loss of momentum and of rapidity in the undulations occurs; the note, if it be a continuous musical sound, is lowered. Savart proved that sounds may be audible which result from the succession of 24,000 impulses in a second; and, at the other extreme, of lowness, he found them audible when produced by seven or eight impulses, or fourteen or sixteen half-vibrations in a second.

If sound is conveyed by contact from air to water, a considerable loss is produced. But if a solid body, such as a metallic plate or an animal membrane, be placed upon the surface of the liquid, intervening between it and the vibrating air, there is less diminution.

Precisely this arrangement exists in the ear. Sonorous waves are conveyed to the extremities of the auditory nerve by undulations (reciprocal and resonant) of *solids*, *liquid* and *air*. First, as we ordinarily hear, the waves of air enter the meatus and strike upon the membrana tympani. Thence the undulations are carried inward, by 1st, the *walls* of the tympanum; 2d, the chain of bones; 3d, the air within the tympanum. Thus they reach the *fenestra ovalis* by the foot of the stirrup-bone (stapes); the *fenestra rotunda* through the air; and the general surface of the labyrinth by the walls of the tympanum. Then the *liquid* (perilymph, endolymph) of the vestibule, cochlea, and canals receives the vibrations, and transmits them to the auditory nerve.

Defect of hearing may be produced by several causes. Slight degrees of it may attend the accumulation of hard wax in the ear; thickening, from catarrhal inflammation, of the membrana tympani; or obstruction of the Eustachian tube. More serious deafness follows perforation or destruction of the membrana tympani, or partial destruction of the chain of bones in the tympanum. *Total* loss of hearing only occurs when the auditory nerve, or its sensorial ganglionic centre, is paralyzed. A simple test will show whether deafness, in any case, be nerve-paralytic, or connected only with the mechanical apparatus of the ear. If it be the latter, the ticking of a watch may be heard if it be placed between the teeth; as the solid bones of the face and head, and the air entering the Eustachian tube, conduct the sound. This will not be the case, and no sound will be heard, if the auditory nerve has lost its receptive or transmitting power.

Vision.

An expanded surface sensitive to light, an optic nerve to convey impressions made by it, and a sensorial ganglion to receive and *perceive* them; these are the parts essential to sight. Beyond these, the eye is a visual *apparatus*, compared often to a *camera obscura*, or a photographer's instrument.

Light is the subject of an abstruse mathematical science, Optics. Some account of it is usually given in connection with chemical physics (see *Chemistry*). Brief allusion to a few facts concerning it is unavoidable here.

Adopting the *undulatory* theory, we conceive light to consist of extremely rapid vibrations, conveyed from luminous bodies to the eye through the *æther* which pervades space. This universal æthereal fluid penetrates even solid bodies, affecting and being affected by the state and movement of their particles. Heat, electricity, galvanism, and magnetism, no doubt, involve its wave-movements, as well as those of ponderable substances. Light travels through space at the rate of from 186,000 to 192,000 miles[1] in a second.

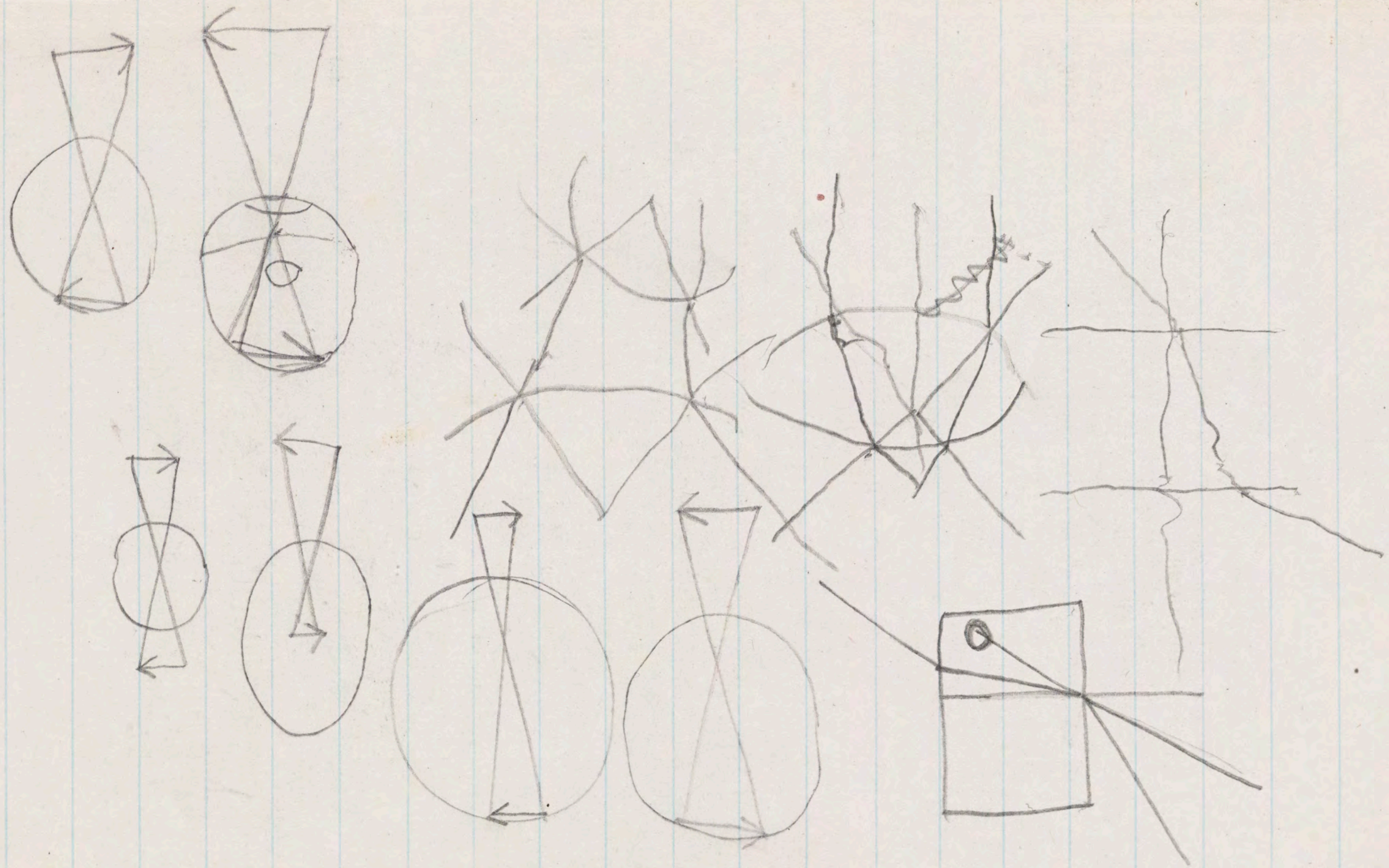
Certain bodies *transmit* light; they are transparent. *Reflection* of light is a universal phenomenon or property of solids and liquids, although in very different degrees. The *direction* of reflected rays is governed by their line of incidence, and the reflecting surface; according to the law of mathematical physics, that *the angle of incidence and the angle of reflection are equal.* The *colors* of bodies depend upon the colors of the rays of light which they reflect. A red body reflects only red rays; a green one, only green rays, &c. A black body, however, does not (theoretically) reflect any light at all. A white one reflects the whole of the light falling upon it.

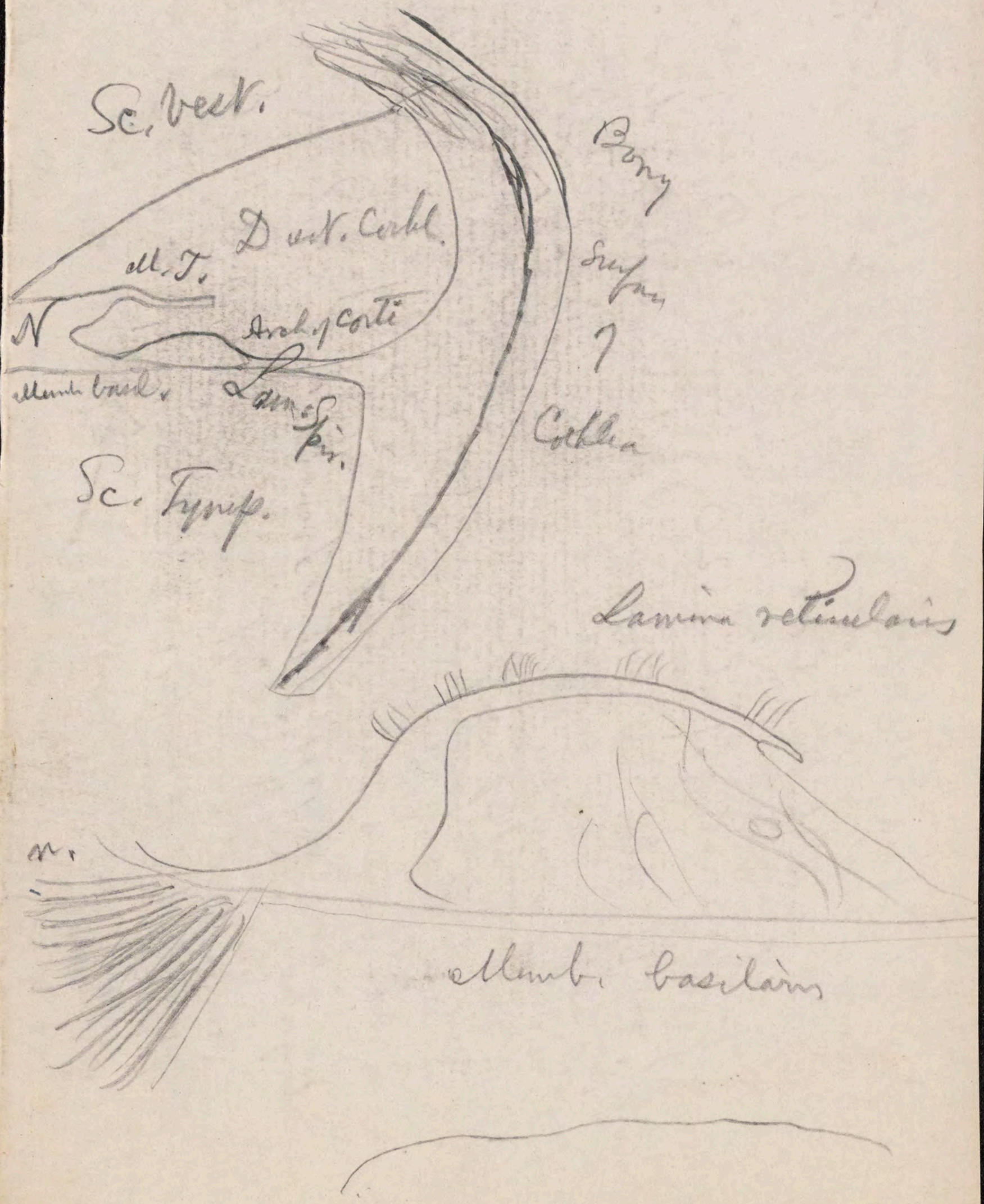
Passing *through* transparent media, as water, glass, &c., rays of light are often made to change their course. This is called *refraction.* Thus a marble, at the bottom of a cup, not visible to an eye at a certain distance beyond its edge, when the cup is empty, will seem to *rise up* and be seen over the edge when water is poured into it.

Emerging from water into air, a ray of light is bent in one direction; going from air into water, in another. Referring both, for comparison, to a line drawn perpendicularly to the surface entered or left, the law is thus expressed: a ray of light, in passing from a denser to a rarer medium, is refracted *from* the perpendicular; in passing from a rarer to a denser medium, *towards* the perpendicular.

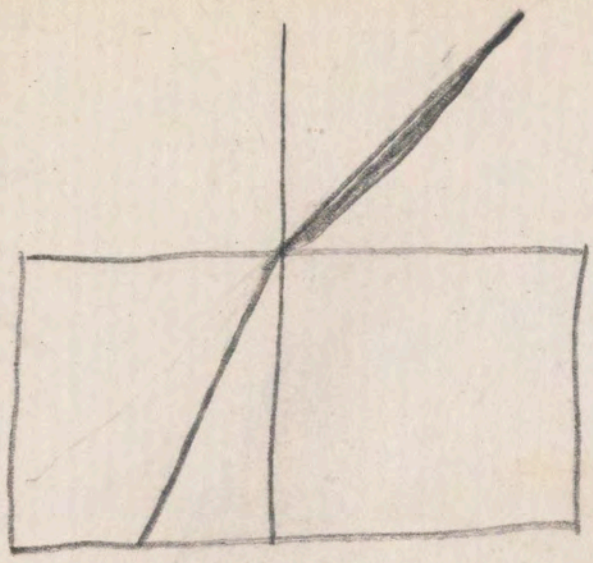
But refraction does not occur to the same extent or in just the same way with all substances, or with bodies of all forms. *Double refraction* and *polarization* of light are complex optical phenomena which cannot be entered upon here. By the action of a simple prism of glass, a ray of light in its transmission is *decomposed,* or separated into the seven rays of the *spectrum,* identical with those of the rainbow. Three *primary* rays are admitted, red, yellow, and blue; the others being combinations of these in different proportions. That white light is really made up of a union of all the

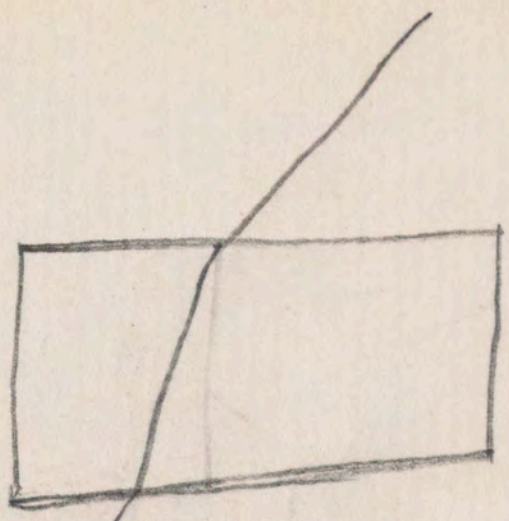
[1] According to different authorities.

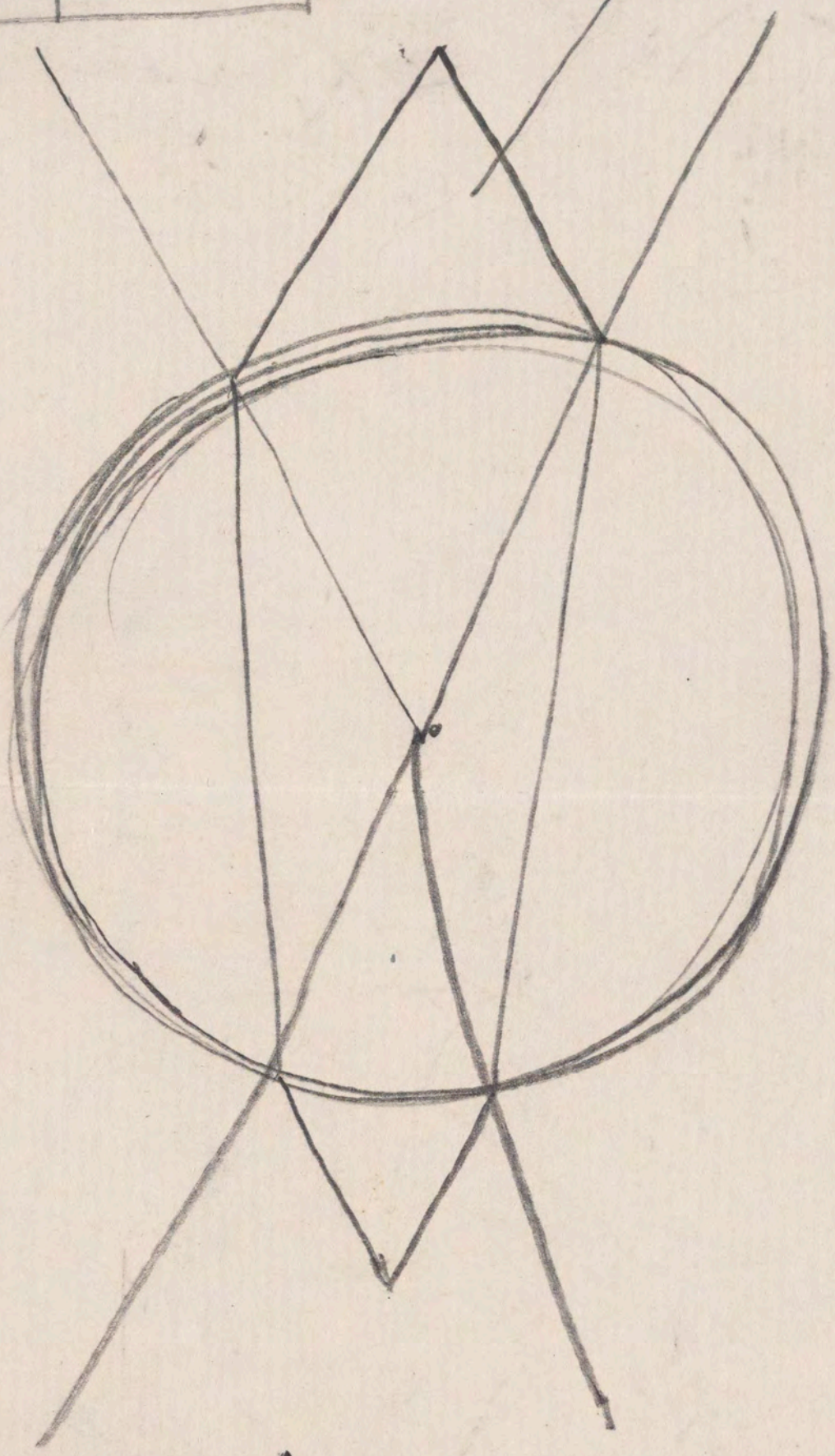


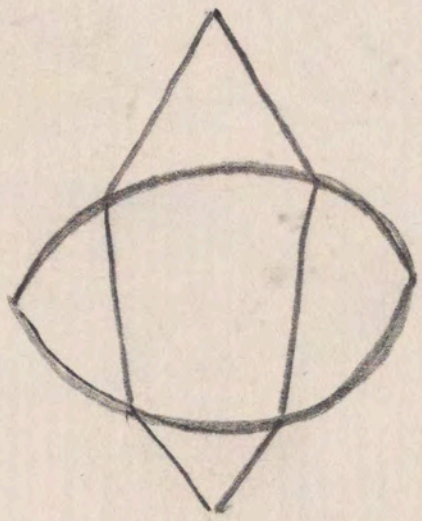

Sc. vest.
Bony
Dust. Cochl.
M. T.
N
Arch. of Corti
Membr. basil.
Lam. Spir.
Sc. Tymp.
Cochlea
Lamina reticularis
Membr. basilaris

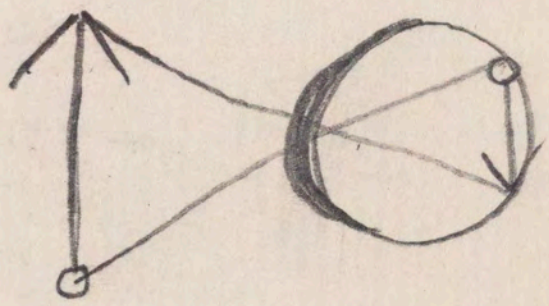
In Stricker's Manual of Histology (1100 pp. octavo:)
100 pp. are given to the Ear; 40 (waldeyer) to Cochlea
& auditory nerve; of which 20 are devoted to Organ of Corti!
about 12 pp. also are occupied with Eustachian Tube alone.
That is the way the German histologists are now working;
it is enough to frighten anybody who has anything
else to do besides studying the results of microscopical
investigation. After the French have criticized
and ruminated over these results, and the English
have digested them, Americans and others may so assimilate
them as to make them ready for mental nutrition.
Yet, much to be found out as to the special functions of the parts of the ear.

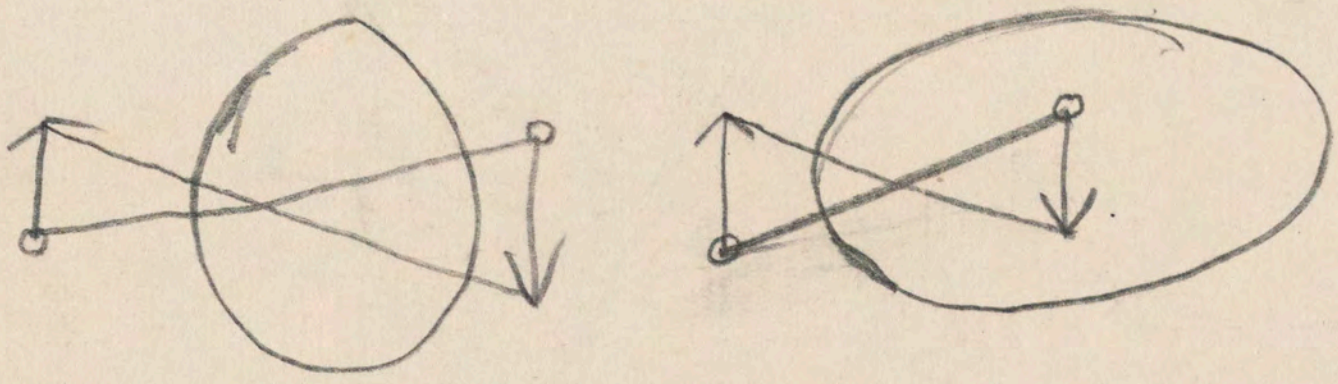


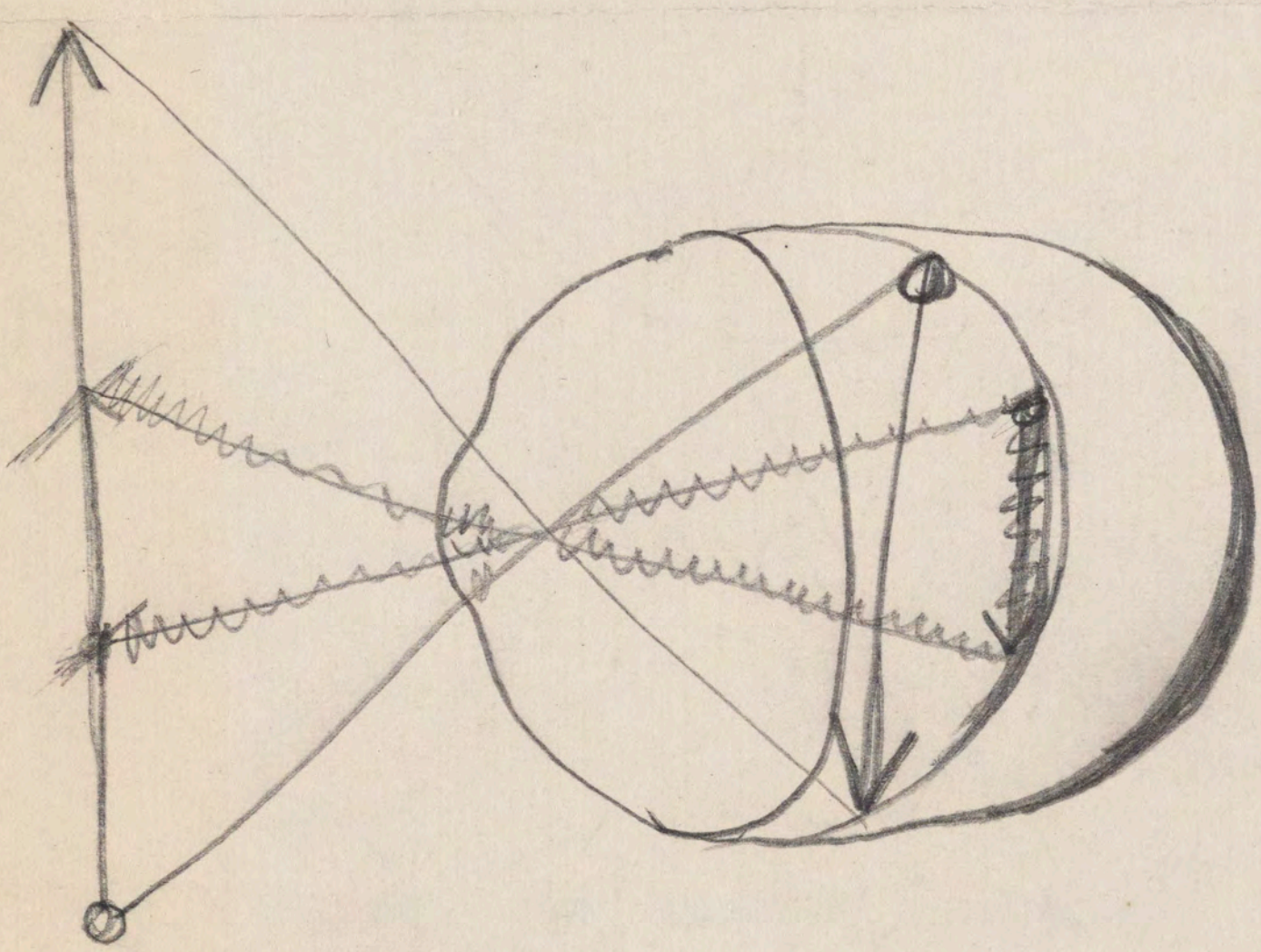


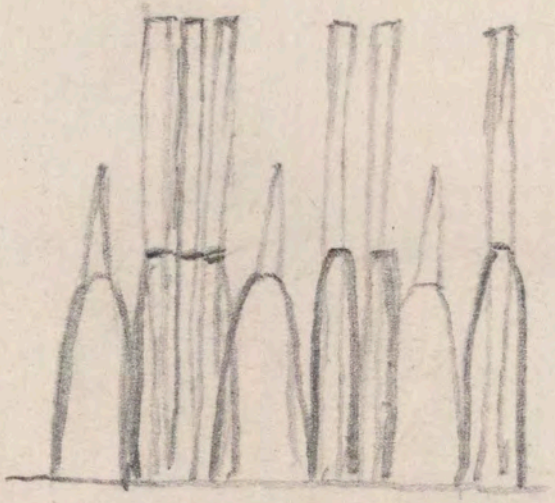












Rods & Cones of Retina. Max Schultze.

but the paresis of the arm was much less intense. It was the same with the aphasia. The patient could "find his words" easily, he could even count from 80 to 97 very distinctly, which he could not do before. His hebetube almost completely disappeared. The improvement continued, and, with the exception of an attack of erysipelas, which disappeared on November 9, the results of the operation were entirely satisfactory. The patient now is completely recovered. MM. Proust and Terrillon instituted a series of experiments, having for their object to determine the point of the cerebral convolutions which had been irritated. They arrived at the conclusion that the seat of the lesion ought to be the ascending parietal convolution at the level of the second frontal, and that the ascending frontal and the second and third frontal convolutions ought to be secondarily affected. This case harmonizes with the results of Ferrier's experiments, and also with autopsies in a certain number of cases of superficial softening recorded by Charcot and others. On the 5th inst. a letter was read at the French Academy of Medicine from Dr. Raynaud, of the Lariboisière, bearing on M. Proust's case as above recorded. Dr. Raynaud had a patient suffering from phthisis, who, three days before death, was taken suddenly with a paralysis limited to the left upper limb, affecting almost exclusively the extensor muscles of the hand on the forearm. At the autopsy, Dr. Raynaud could only find a single lesion, viz., a very small focus of red softening developed in the right hemisphere around a meningeal tubercle. This patch, which did not exceed the dimensions of a twenty-centimes-piece, was situated on the ascending parietal convolution in the gray substance forming the floor of the fissure of Rolando, less than two inches from the upper internal edge of the hemisphere. This point, according to Ferrier's experiments on monkeys, is in relation with the movements of the forearm. Dr. Raynaud's observation was, to the best of his belief, the only one in which brachial monoplegia had existed to the exclusion of every other cerebral phenomenon, and which permitted a relationship to be established between the anatomical lesion and the functional trouble.—*Med. Times and Gaz.*, Dec. 16, 1876.

On Photo-Chemical Processes in the Retina.

On January 5th, Dr. W. Kühne, Professor of Physiology in the University of Heidelberg, read before the Naturhistorisch-Medicinisches Verein, of Heidelberg, a paper entitled "Zur Photo-chemie der Netzhaut." The following abstract of it is published by Dr. Arthur Gamgee in *Nature* for February 1st.

A short time since, Boll (a pupil of Max Schultze and Du Bois-Reymond, who now occupies the Chair of Physiology in Rome) communicated to the Berlin Academy the remarkable fact that the external layer of the retina, *i. e.*, the layer of rods and cones, possesses in all living animals a purple colour. During life, according to Boll, the peculiar colour of the retina is perpetually being destroyed by the light which penetrates the eye; darkness, however, restores the colour, which vanishes forever almost immediately after death.

The wonderfully suggestive nature of Boll's discovery led Kühne to repeat his observations; in doing so, whilst he has confirmed the fundamental statement of Boll, he has ascertained a number of new facts of great interest.

Kühne's observations were made on the retina of frogs and rabbits. In the first place, implicitly relying upon the statements of Boll, he examined, as soon as possible after death, the retina of animals which had been kept for some time in darkness. He soon found that the beautiful purple colour persists after death if the retina be not exposed to light; that the bleaching takes place so slowly in gas light, that by its aid the retina can be prepared and the changes in its tint deliberately watched; that, when illuminated with monochromatic sodium light, the purple colour does not disappear in from twenty-four to twenty-eight hours, even though decomposition have set in.

These first observations of Kühne on the vision-purple (*Sehpurpur*), as he terms it, whilst they showed that the disappearance of the colour is not, as Boll had asserted, a necessary concomitant of death, removed many of the difficulties which stood in the way of a careful investigation. Carrying out his preparation in a dark chamber illuminated by a sodium flame, Kühne was able

THE MONTHLY ABSTRACT

OF

MEDICAL SCIENCE.

VOL. IV. No. 4. For List of Contents see last page. APRIL, 1877.

Anatomy and Physiology.

The Localization of Functions in the Cortex Cerebri.

M. PROUST has communicated to the Académie de Médecine (*Gaz. des Hôp.* December 2) a case of extreme interest bearing on the doctrine of localization of functions in the cortex cerebri. A young man, aged nineteen, on October 8 was drunk. In struggling with somebody he received a severe wound on the left side of his head from a bayonet. Blood escaped freely, and in a few moments later the man lost consciousness for about a quarter of an hour. The day following there was a second loss of consciousness equally short. Throughout the day the man felt giddy and dull, but he had no trouble in movement or in speech. He had been taken to Mazas. On the 17th, when he left prison, he was in a satisfactory condition. It was only on October 19 or 20—that is to say, eleven days after the accident—that the phenomena appeared, for which he was admitted under Dr. Proust, at Saint Antoine. First he had difficulty in finding his words, then the embarrassment of speech gradually increased, and he lost power in his right hand. According to his account he had had very little pain, no vomiting, no convulsion, and no "contracture" when he was admitted to Saint Antoine. On October 24, he had right facial paralysis limited to the muscles supplied by the lower branches. His tongue pointed towards the paralyzed side—that is, towards the right; the uvula pointed to the left. The sensibility of the pharynx and palate was intact. He had incomplete motor paralysis of the right arm, but sensation was unaltered. At times there was itching in the fingers of the right hand. The movements of the hand were very awkward. The paralyzed muscles responded well to faradism. The patient showed a certain amount of hebetude, a little drowsiness, and considerable indifference to what passed around him. Nevertheless, his intelligence did not appear sufficiently altered to explain the trouble which he had in stating his ideas—the difficulty with which he found his words, which he often substituted for one another. He had, in fact, a certain degree of aphasia. The lower right limb and all the left side were free. There were no ophthalmic or auditory changes. His pulse was 52, and his temperature 98.6°. On the left parietal region there was an oblique wound extending downwards and forwards about an inch and a quarter long; it was situated at the level of the parietal eminence, at a vertical height of about three inches and three-quarters above the external auditory meatus. The localization of the paralysis on the side opposite to the wound of the scalp evidently established the existence of some compression or irritation of the surface of the brain corresponding with the parietal; and as the phenomena were not manifested until more than ten days after the accident, M. Proust thought that the compression or irritation was the result of a secondary inflammatory action set up by the depression of the skull in that region. M. Proust now called in the aid of his surgical colleague M. Terrillon, and trephining was decided upon. The operation was performed on October 27. Scarcely was it completed—the patient was not yet dressed—when, desiring once more precisely to define the previously observed morbid phenomena, the medical men were struck with an almost instantaneous improvement. The facial paralysis was not very sensibly diminished,

to discover the condition necessary to destruction of the vision-purple as well as some facts relating to its restoration or renewal.

As long as the purple retina is kept in the dark or is illuminated only by yellow rays, it may be dried upon a glass plate without the tint changing; the colour is not destroyed by strong solution of ammonia, by saturated solution of common salt, or by maceration in glycerine for twenty-four hours. On the other hand, a temperature of 100° C. (212 Fahr.) destroys the colour, and alcohol, glacial acetic acid, and strong solution of sodium-hydrate produce the same effect.

Kühne's next observations were directed to the discovery of the influence of light of different colour upon the vision-purple. It would appear that the more refrangible rays of the spectrum have the greatest action, and that the red rays are as inactive as the yellow.

Kühne now found the incorrectness of Boll's assertion that the retina of the living eye exposed to ordinary daylight does not exhibit the vision-purple, for on preparing the eyes of animals which had just been exposed to light, as rapidly as possible in the chamber illuminated by sodium light, he discovered that the retina was of a beautiful purple. It was only when eyes were exposed for a considerable time to the direct action of the sun's rays that a fading of the purple colour was perceived.

A most suggestive experiment now threw some light upon the circumstances which retard the decolorization, and which restore the vision-purple. The two recently extirpated eyes of a frog were taken; from one the retina was removed, whilst an equatorial section was made through the other eye, so as to expose the retina and still leave it *in situ*. Both preparations were exposed to diffuse daylight, until the isolated retina had lost its purple colour. On now taking the other preparation into the yellow chamber and removing the retina, it was found that its colour yet remained; it was *dark red*, but was bleached when exposed in its naked condition to daylight.

This experiment was confirmed by others, in which the effect of strong sunlight was substituted for that of diffuse daylight.

But the most curious results of Prof. Kühne's experiments have reference to the restoration of the vision-purple. If an equatorial section be made through a recently extirpated eye, and a flap of retina be lifted up from the underlying choroid and exposed to light, the purple colour of the flap will be destroyed, whilst the colour of the rest of the retina persists. If, however, the bleached portion of the flap be carefully replaced, so that it is again in contact with the inner surface of the choroid, complete restoration of the vision-purple occurs. This restoration is a function of the *living* choroid, probably of the living retinal epithelium (*i. e.*, of the hexagonal pigment-cells, which used formerly to be described as a *part* of the choroid), and it appears to be independent of the black pigment which the retinal epithelium normally contains. As it is absolutely dependent upon the life of the structures which overlie the layer of rods and cones, it is natural that it should be observed to occur for a longer time after somatic death in the frog than in the rabbit.

Kühne's researches, though suggested by the interesting observation of Boll, have not only corrected many errors which that observer had committed, but have led to the discovery of facts which add immensely to the importance of the newly-observed vision-purple.

They have shown that the living retina contains a substance which under the influence of light undergoes chemical changes, which vary in intensity according to the intensity and character of the luminous rays, and they point to the existence of structures in connection with the retina which as long as they are alive are able to provide fresh stores of substance sensitive to light.[1]

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[1] I have repeated all the more important observations of Kühne with the eyes of several *Ranæ temporariæ*, and with those of two rabbits, of which one was an albino, and can entirely confirm all his interesting facts. In ordinary daylight, the purple-red colour of the frog's retina, and its subsequent decolorization, may be most satisfactorily demonstrated. The use of the dark chamber illuminated by sodium is, however, useful in cases where the dissection of the eye has to be conducted with care.—A. G.

Since the above account of Kühne's researches was written, he has published in the *Centralblatt für die Medicinischen Wissenschaften* (January, 1877, No. 3) a short paper, dated January 15, in which he announces the startling confirmation to his previous researches afforded by his *having been able to obtain actual images on the retina which corresponded with objects which had been looked at during life* (!).

The discoveries of Boll and Kühne must, as the latter remarks, have led to the thought that after all there might be some truth in the stories which we all have heard of images of things seen in death being left imprinted on the eye. After his first researches Kühne endeavoured over and over again to observe on the retina of rabbits bleached spots corresponding to the images of external objects, but his endeavours failed. As Kühne remarks, and as all readers who have understood his experiments will allow, in order to obtain a permanent photograph, or, as he terms it, *optogramme*, the effect of the light would have to be so prolonged or so intense as to destroy the balance between the destruction of the vision-purple and the power of the retinal epithelium to restore it.

Kühne took a coloured rabbit and fixed its head and one of its eyeballs at a distance of a metre and a half from an opening thirty centimetres square, in a window shutter. The head was covered for five minutes by a black cloth and then exposed for three minutes to a somewhat clouded midday sky. The head was then instantly decapitated, the eyeball which had been exposed was rapidly extirpated by the aid of yellow light, then opened, and instantly plunged in 5 per cent. solution of alum. Two minutes after death the second eyeball, without removal from the head, was subjected to exactly the same processes as the first, viz., to a similar exposure to the same object, then extirpation, etc.

On the following morning the milk-white and now toughened retinæ of both eyes were carefully isolated, separated from the optic nerve, and turned; *they then exhibited on a beautiful rose-red ground a nearly square sharp image with sharply defined edges; the image in the first eye was somewhat roseate in hue and less sharply defined than that in the second, which was perfectly white. The size of the images was somewhat greater than one square millimetre.*

Professor Bunsen was amongst the witnesses of this beautiful experiment.—*London Med. Record*, Feb. 15, 1877.

Materia Medica and Therapeutics.

Physiological Action of Nitrite of Amyl.

Mr. W. Lemon Lane (*British Med. Journ.*, Jan. 27, 1877) submits the following deductions, which are the result of a series of experiments performed to ascertain the physiological action of nitrite of amyl.

1. Amyl-nitrite, when inhaled in small quantities, produces reddening of the face in man, and of the nose and mouth in kittens; this action is due, according to Brunton, to the dilatation and overfilling of the arterioles.

2. When inhaled by kittens in large quantities, it produces cyanosis of the nose and mouth along with insensibility. The cyanosis arises from overdistension of the venous system, this being due to the engorged arterioles propelling the blood into the veins, while the insensibility is probably caused by overdistension of the venous system and the heart.

3. When inhaled in small quantities, it produces recovery from chloroformic insensibility, by dilating the arterioles of the brain, and thus removing the cerebral anæmia due to the chloroform.

4. When inhaled in large quantities, instead of producing recovery from chloroformic insensibility, it not only retards it, but it may cause death by paralysis and overdistension of the heart, and engorgement of the venous system.

B

25

Motion continued

Complementary Colors

Red - Green

Spectra, shutting eyes

(Green & Violet - Helmholtz)

Red, Yellow & Blue the primary colors;

red complem. of green (yellow & blue);

blue of orange (red & yellow);

yellow of purple (red & blue). See opposite p. 296 Helmholtz

Complementary colors near each other have an appreciable effect to the eye, in dresses, carpets, &c.

○ +

Yet Yellow & Blue rays make White!

The selection of red yellow & blue as primary was suggested by painters' colors; not the spectrum.

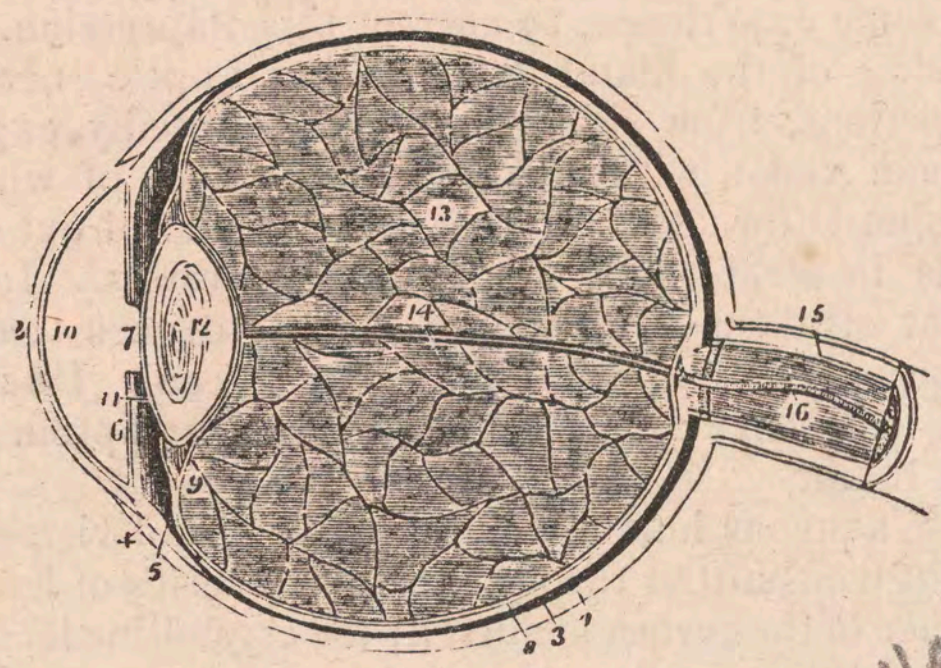
Pure primary, undecomposable colors are hard to make or get by isolation.

colored rays, may be demonstrated by a physiological experiment. If a circular disk or flat piece of pasteboard be divided into seven equal parts, by lines radiating from the centre to the circumference, and the seven colors of the spectrum be painted upon these, when the disk is made to revolve rapidly it will appear to be white. This happens because the impression of any visible object upon the retina *remains* for a moment after looking at it. The quick succession of impressions, therefore, in the revolution of the disk, blends all the colors into one, and the result is whiteness.

Upon modifications in the reflection and refraction of light caused by different materials, forms, positions, and other conditions of bodies, depend the uses of the parts of the eye as an organ. For the full description of these parts we must refer to *Anatomy*.

The transparent media of the eye are, the *cornea*, *aqueous humor*, *crystalline lens*, and *vitreous humor*. The receptive surface upon

Fig. 157.



SECTION OF EYEBALL.

which, within the chamber of the eye, the picture or image is thrown (as upon the sensitive prepared plate of the photographer's apparatus) is the *retina*. Of this, the most important layers, physiologically, are, 1, the layer of rods and cones, which suggest analogy to the *papillæ* of touch; 2, the layer of ganglionic nerve-cells; 3, the radiating expansion of the terminations of the optic nerve.

It is very remarkable that the point of entrance of this nerve into the retina, which is just within (*i. e.*, nearer to the nose than) the centre of its surface, is devoid of sensibility to light, as shown by careful experiments. At the centre of the retina, the *yellow spot* of Sœmmering is the point of most distinct vision. Evidently, the image of any object upon the retina must be *inverted;* because, the rays from its upper and lower extremities crossing each other as they enter the pupil, those rays from the top of the object

must pass through to the bottom of the retina, and those from the bottom must go to the top of the same receptive surface. How, then, do we see everything right side up? Several theories have been proposed to explain this, which is certainly not a mere result of experience or education. Perhaps the crossing of the fibres of optic nerves, from the top and bottom of the retina, respectively, may *reverse*, in their conveyance of impressions to the tubercula quadrigemina, the picture itself. More reasonable, perhaps, it is, to suppose that the mind really sees, not *the retina with the image* upon it, as some imagine—but, *from* the retina; that is, there receives and perceives waves of light from the reflecting visible *object*. So, as we refer a blow upon the hand or body to one or another source by our minds tracing backwards the direction of its impression upon us, we in like manner refer a ray of light to an object by tracing backwards its direction. When we look at a mirror, for example, and see an image of anything in it, the image *seems* to be *beyond* the glass; and it requires an effort of thought, or some experience, to correct this impression.

The crossing of the filaments of the two optic nerves in all possible directions, from side to side, ~~undoubtedly~~ explains the *unity* of human vision with two eyes, upon each of which a distinct impression is formed. If the eyes are placed out of correspondence, as in strabismus, double vision results. In habitual or permanent strabismus, the mind is apt to accustom itself to give attention only to one of the two images seen. Double vision is sometimes *subjective; i. e.*, connected as a symptom with disorder of the brain.

The cornea, aqueous humor, crystalline lens, and vitreous humor act upon light transmitted through them as a series of lenses. The anterior surface of the cornea is convex; the crystalline lens is doubly convex, the posterior surface being the most convex of the two. Applying to convex lenses the law of refraction already mentioned, that, in passing from a rarer to a denser medium, rays of light are bent or refracted *towards* the perpendicular, and remembering that at any part of the surface of a sphere a perpendicular to it is continuous with a straight line going to its centre, it will be obvious that parallel rays (or those nearly parallel) must, by such a lens, be made to *converge*, and, finally, to meet. The place at which the rays from any body thus unite is called the *focus* of the lens. Rays not parallel but divergent, as from a small and near body, cannot be brought so soon to a focus, unless the lens is modified so as to increase its refraction.

Adjustment of the eye to different distances, then, needs explanation. The theory now adopted is, that, as the eye *reposes* in distant vision, effort is required only for the sight of near objects; and that this is effected by pressure upon the lens, by the *ciliary muscle;* which is described by Wharton Jones, H. Müller, and

Change of focal distance, from object distant enough to send parallel rays, & one 4 inches from eyes. 2nd (optics) and the only (Olbers) .143 inch.

Rouget as consisting, like the iris, of circular and radiating fibres. Perhaps the vascular processes of the *ciliary body* may also, as an erectile structure, assist in compressing the lens when distended with blood.

The *iris* contracts when we look at near objects, and thus excludes the most divergent rays. The general purpose of the iris is to regulate the amount of light entering the eye through the pupil. By reflex action, its circular fibres contract under the stimulus of light. When that stimulation is withdrawn, the radiating fibres dilate the pupil. The contraction of the pupil may be artificially produced by the action of the Calabar bean, or by opium in poisonous doses. Dilatation of the pupil follows the local or systemic action of stramonium, belladonna, hyoscyamus, or their active principles. The *afferent* or sensory nerve of the iris is the 5th; the motor nerve in contraction of the pupil is the 3d; dilatation is under spinal and sympathetic influence.[1]

Optical instruments are liable especially to two defects: *chromatic* and *spherical aberration.* The first consists in change of color in objects seen through lenses, owing to the differently-colored rays being unequally refracted in their transmission. The second is the deviation and confusion of rays impinging upon different parts of the surface of a convex lens. Those rays which pass from the centre of an object straight through the centre of the lens, are not *refracted* at all. Those striking at a small distance from the centre are made to *converge* somewhat; those entering near the margin or circumference, converge very much, So, they do not all meet in one focus, and an indistinct image results.

The correction of *chromatic* or color aberration is, by opticians, effected by using several lenses, of different materials, refracting the rays of light differently; so that one corrects (by reversing it) the inequality produced by another. Thus, if the arrangement be perfect, colorless rays, or rays without change of color, are transmitted. In the construction of the eye, this principle is illustrated by a combination of several refracting media; the cornea, aqueous humor, crystalline lens, and vitreous humor.

Spherical aberration is, in the eye, corrected in two ways. For one, the *iris* serves to exclude those rays which would strike the margin of the convexity of the lens; and thus their tendency to confuse the image is prevented. Also, the *structure* of the crystalline *lens* admirably preserves the eye against this deviation of light. The lens is *most dense at the centre*, and lessens gradually in density towards the circumference. Thus those rays which strike it *near* the centre are made to converge more, in proportion, than those striking it towards the margin; more, that is, than the form

[1] The pupil contracts, under strong light, after death; according to Brown-Séquard, in eels and frogs, sixteen days after death. Exactly what is the relation between the 5th nerve and the iris is unsettled. When its ophthalmic branch has been divided the iris becomes immovable, in some animals contracted, in others dilated.

of the lens would cause them to do, if it were homogeneous; but just the same as the others, by this correction; so that a clear image is made.

Our ideas of the *distance* of objects are obtained through *experience*, with the comparison of other senses than sight, and the use of our powers of locomotion. To a person cured of congenital cataract, as in a case reported by Cheselden, or to one like Caspar Hauser, brought out into the light after years of imprisonment in darkness, everything seems at first *upon* or very near to the eye.

Size, also, is only very imperfectly determined by sight *alone*. The *visual angle* gives us some estimate of it; that is, the angle made by the rays coming from the top and bottom, or the right and left side, of an object, and meeting upon the retina. Also, we are aided in measuring the size of an object seen, by the *muscular sense* of the muscles which move the eye up and down, or from side to side, in looking at it all over.

Our knowledge of the size of any object will facilitate our making an estimate of its distance; and so, if we know its distance, we can judge better of its size. Hence, on a foggy day, many things look larger than they actually are, because haziness gives an impression of distance; while, on the contrary, in an extremely clear atmosphere, things of unknown size may appear to be very near but small.

The *thaumatrope* is a simple toy, which well illustrates the fact that impressions made upon the eye remain for a little while. It consists of a piece of card, on each side of which is drawn or painted a different picture, the two bearing some relation to each other; as, on one side a bird, on the other a cage; or, on one side a man and on the other a horse. When the card is made to revolve rapidly so as to present the two sides alternately, the images are combined into one; and the bird may be seen in the cage, or the man on the horse.

The *stereoscope* of Wheatstone is an instrument composed of two lenses, so placed as to cause two pictures of the same object, one representing the right side of it and the other the left (Fig. 158), to appear as one. The impression of *solidity* and perspective, which, in actually solid objects, we gain by the use of both eyes together, is thus perfectly conveyed by flat pictures; as photographs, for example.

Imperfections of sight, in various degrees, are common and important. Their study and treatment belong to the special department of ophthalmic surgery. A few of them may be here briefly mentioned.

Near-sightedness, or *myopia*, is the most frequent of all. It is owing to too great a *convexity* of the crystalline lens, or else to an excess of length of the eyeball antero-posteriorly; the rays falling upon the eye from a distant object being brought to a focus *too*

Newly hatched Chickens — Spalding —

for p. 293

Helmholtz view, of

adaptation of every filament (?)

of optic nerve to a certain hue only.

Illustr. by spectrum seen on shutting

eyes after looking at a bright colored

object: always the complemental colors.

Thus red & green, yellow & purple

orange & blue are complemental; i.e.,

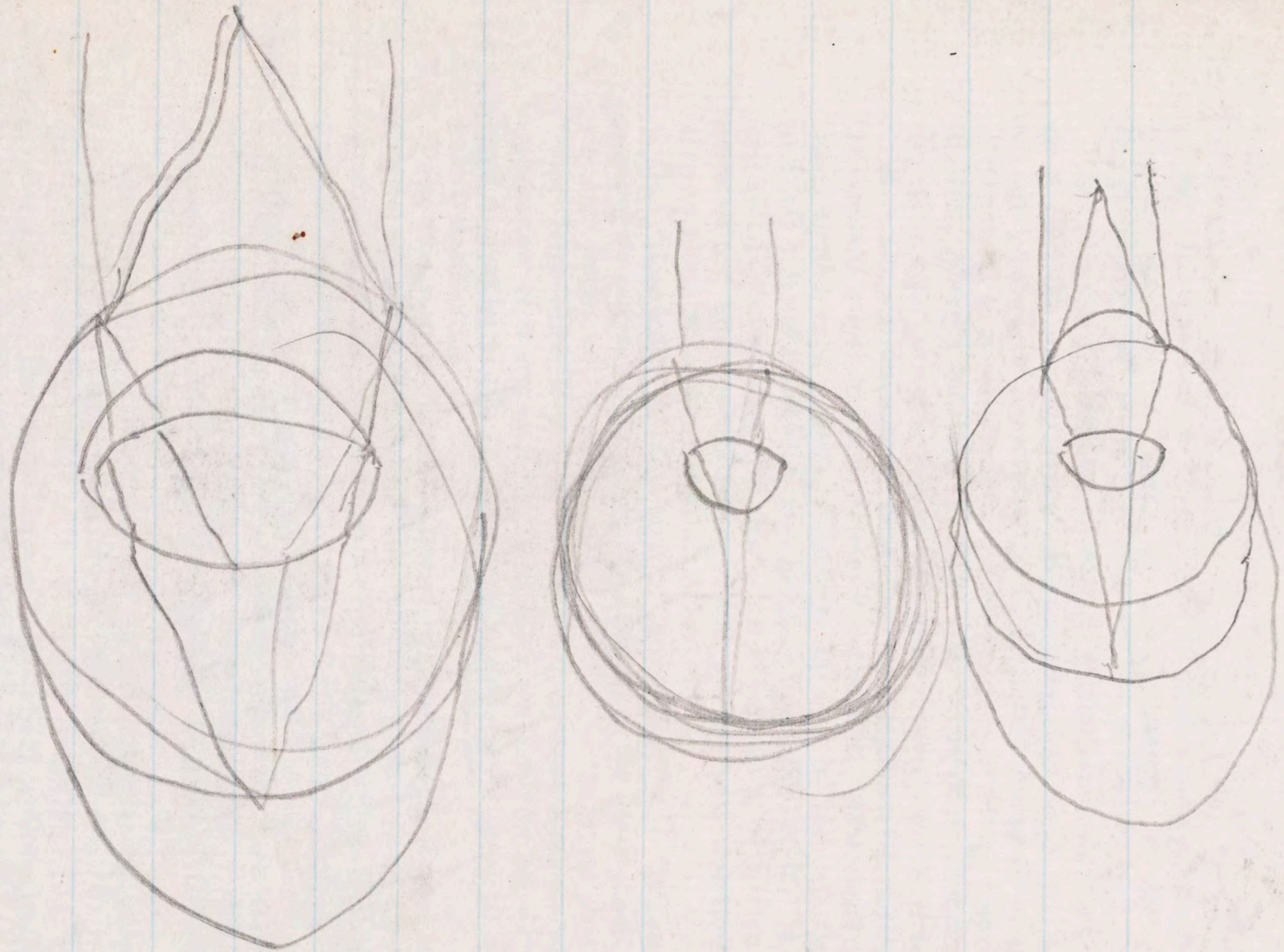
together they make white light. After

looking awhile at red, the red-perceiving

nerve filaments are said to be "wearied" — & only

the remaining, green, rays are seen in the

spectrum left. [Question this theory of Young & Helmholtz]



~~Correct~~ Roods (quote) figures

minimum

duration of a visual impression,

$\frac{1}{25,000,000}$ of a second.

$\frac{1}{3}$ of a second

$\frac{1}{3000}$ of a second

maximum

Sound probable minimum

B

26

Vision concluded

Voice

Changes in the eye come with age, before any approach to blindness appears. 1, Lessened sensibility to impressions of light; 2, loss of strength in the accommodating muscle (ciliary, it is supposed). 3, loss of elasticity of the lens. 4, Increased permanent flatness of the lens. Senile blindness is mostly either cataractous or paralytic (amaurotic).

[Arcus Senilis]

Divergent strabismus with myopia

Convergent " " hypermetropia

Paralysis of internal rectus with asthenopia

" (or weakness) of ciliary muscle "

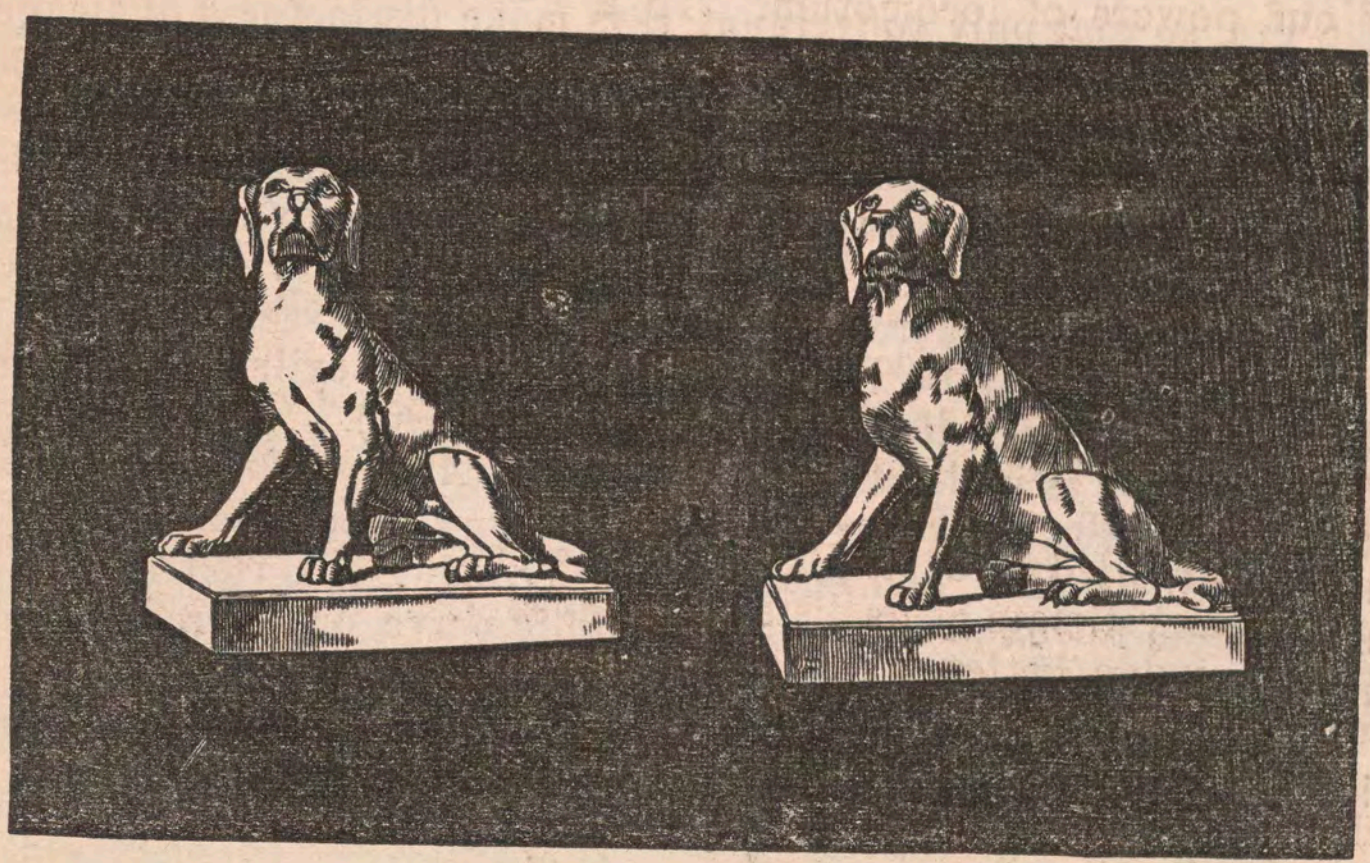
Nerve-failure — neur- "

muscular — my- "

Do the circular fibres of the ciliary muscle flatten the lens?

soon, that is, in front of the retina. The correction of this is obtained by the use of *concave* glasses, which by their refraction move back the image to the retina.

Fig. 158.



STEREOSCOPIC VISION.

Long-sightedness, or the incapacity to see objects at short distances, is due to causes the reverse of the above; the lens being *too flat*, or the eye too short from before backwards. The rays then converge too little to make an image upon the retina; their focus falling *behind* it. This (very common in old people) is corrected by *convex* glasses, which bring the rays to a focus sooner. Because of the frequency with which old persons experience this defect of vision, it is commonly called *presbyopia*. But age is apt to bring with it other kinds of failure of sight also; and it is oftenest a loss of power to *accommodate* the eye to the distance of objects, the *range* of vision becoming abnormally restricted.

Near point at	10th	year	. . .	$2\frac{2}{3}$ inch from cornea.
" "	20th	"	. . .	$3\frac{5}{9}$ " " "
" "	30th	"	. . .	$4\frac{4}{5}$ " " "
" "	40th	"	. . .	$6\frac{6}{7}$ " " "
" "	50th	"	. . .	12 " " "
" "	60th	"	. . .	24 " " "
" "	70th	"	. . .	144 inches.

(Donders, Fellenberg, &c.)

Terms now much used by opticians are, *emmetropic*, *myopic*, (hypometropic) and *hypermetropic* vision; also, *paralysis of accommodation*, and *astigmatism*. *Emmetropic* is *normal* sight, with the full natural range of accommodation. Many persons can see

to read, for example, with ease, letters at a distance of seven inches from the eyes, or at thirty-six inches, or at any distance between. That is their range of accommodation. *Myopic* persons sometimes can only read with the book two or three inches from the eye. *Hypermetropia* is deficiency in the refracting power of the eye, so that only convergent rays make distinctness of image, and thus only objects at some distance can be well seen. It is what is most generally called presbyopia. *Astigmatism* is indistinctness of vision from differences in refraction by the eye according to the part of it upon which rays fall; a want of harmony in refraction. It is tested by looking at the two lines of a cross, or a large letter T; the lines in different directions not being seen with equal clearness. It may be remedied by employing cylindrical lenses (see *Laurence and Moon's Ophthalmic Surgery*).

Amblyopia is indistinctness of vision. *Asthenopia* is *feebleness* of visual power, shown by the eyes becoming soon exhausted when used, as in reading, and images then becoming confused. This is a symptom of *fatigue* of the retina, optic nerve, or tubercula quadrigemina; calling for *repose* of the organs of sight.

Amaurosis (a term repudiated now by some ophthalmologists) is nerve-blindness, or paralysis of the optic nerve.

Cataract is opacity either of the crystalline lens or of its capsule. Though sometimes congenital, it occurs in much the largest number of instances in advanced life. Occasionally it is observed in connection with *diabetes mellitus;* and, experimentally, it has been produced in animals, by injecting sugar into the tissues. The theory of endosmosis has been brought forward to aid in explaining some of these facts.

Accessory Apparatus of the Eye.—The *lachrymal gland* is very important, on account of the protection its constantly flowing moisture affords in clearing fine particles from the surface of the eyeball, and keeping it from shrinking with dryness. The *Meibomian* glands of the eyelids furnish a sebaceous material which maintains the flexibility of the eyelashes. The *lashes* themselves (cilia) are especially protective in their use, acting somewhat like cow-catchers in front of a locomotive, their convexities being turned towards each other. *Winking* is a (generally automatic and often unconscious) motion of the lids, by which the lachrymal secretion is brought frequently over the ball, and, when needful, the eye is closed against the entrance of foreign bodies. The *eyebrows* (supercilia) are protective overhanging ridges, covered with hairs, which aid in keeping blows or falls from affecting the eyes, and also avert from them drops of perspiration of the forehead. For an account of all these auxiliary structures see *Anatomy.*

Hygiene of Sight.

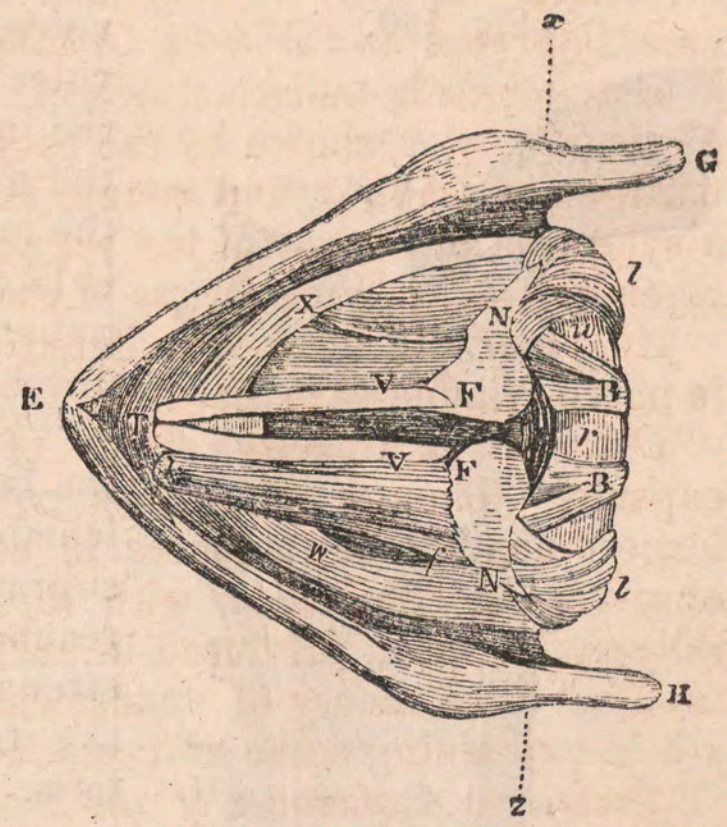
CHAPTER VIII.

THE VOICE.

THE larynx is the organ of voice in man. Referring to Anatomy for the particular description of its parts, we may consider what is its nature as an instrument.

Among musical instruments, two kinds are most decidedly different: *wind* and *stringed* instruments. Of the former, the trumpet, horn, trombone, flute, and fife are examples. Of the latter, the violin, guitar, &c. In wind instruments, the notes vary with the length (and width) of the *column of air*, affected by the closing and opening of the holes, and the manner of impelling air from the mouth. In stringed instruments, the *length, thickness, and degree of tension* of the strings determine the notes principally. In both, the larger vibrating mass, moving in slower waves, gives low notes; the shorter column or cord produces quicker vibrations, and higher notes.

Fig. 159.



GLOTTIS, FROM ABOVE.—G, E, H. Thyroid cartilage. N, F. Arytenoids. T, V. Vocal ligaments. N, *x*, *v*, *k*, *f*, N, *l*. Muscles. B. Crico-arytenoid ligaments.

But there is an intermediate kind of instrument; that with a *tongue* or *reed*, that is, a vibrating plate or membrane, in connection with a tube. The clarionet, bassoon, hautboy, and reed stops of an organ are of this kind. The human larynx is a reed instrument, neither precisely a wind nor a stringed one. The reeds are the *vocal ligaments;* the *epiglottis* is also of that nature.

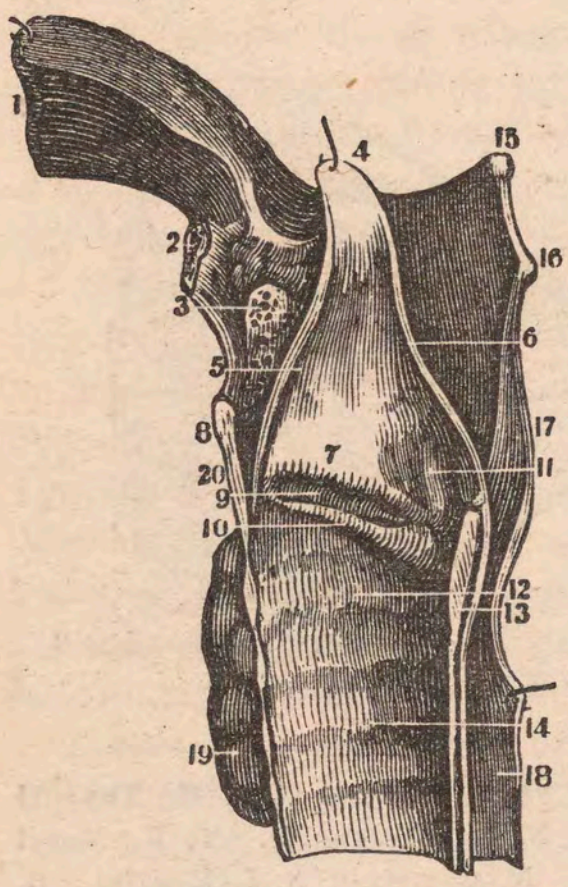
Except in the production of very high notes, only the *inferior* vocal cords are shown, by experiment and by observations with the laryngoscope, to be essential to voice. The *anterior* part of the glottis, also, is the vocal part. The changes which occur in vocalization are, the *widening* and *narrowing* of the *glottis*, and the

Chuffly

increase and diminution of the *tension* of the *ligaments*. These changes are effected by muscles. The *posterior crico-arytenoid* muscles draw back the arytenoid cartilages, and make tense the ligaments; the *crico-thyroid* muscles aid in the same effect. The *posterior arytenoid* muscles, *transverse* and *oblique*, narrow the orifice of the glottis. Both of these movements cause elevation of the pitch of sounds. The *thyro-arytenoid* muscles relax the ligaments by drawing the arytenoid cartilages forward. The *lateral crico-arytenoid* muscles widen the aperture of the glottis. Thus grave or low notes are produced. The lowest human tone has 80 vibrations per second; the highest, 1024 vibrations.

The compass of the voice extends in singers to two or three octaves. The lowest note of the female voice is about an octave higher than the lowest of the male voice, and the highest of the female voice an octave above the highest of the male. This depends chiefly on the greater length of the ligaments in the male larynx. The larynx in boys is like that of the adult female. At puberty it changes, with other sexual developments.

Fig. 160.

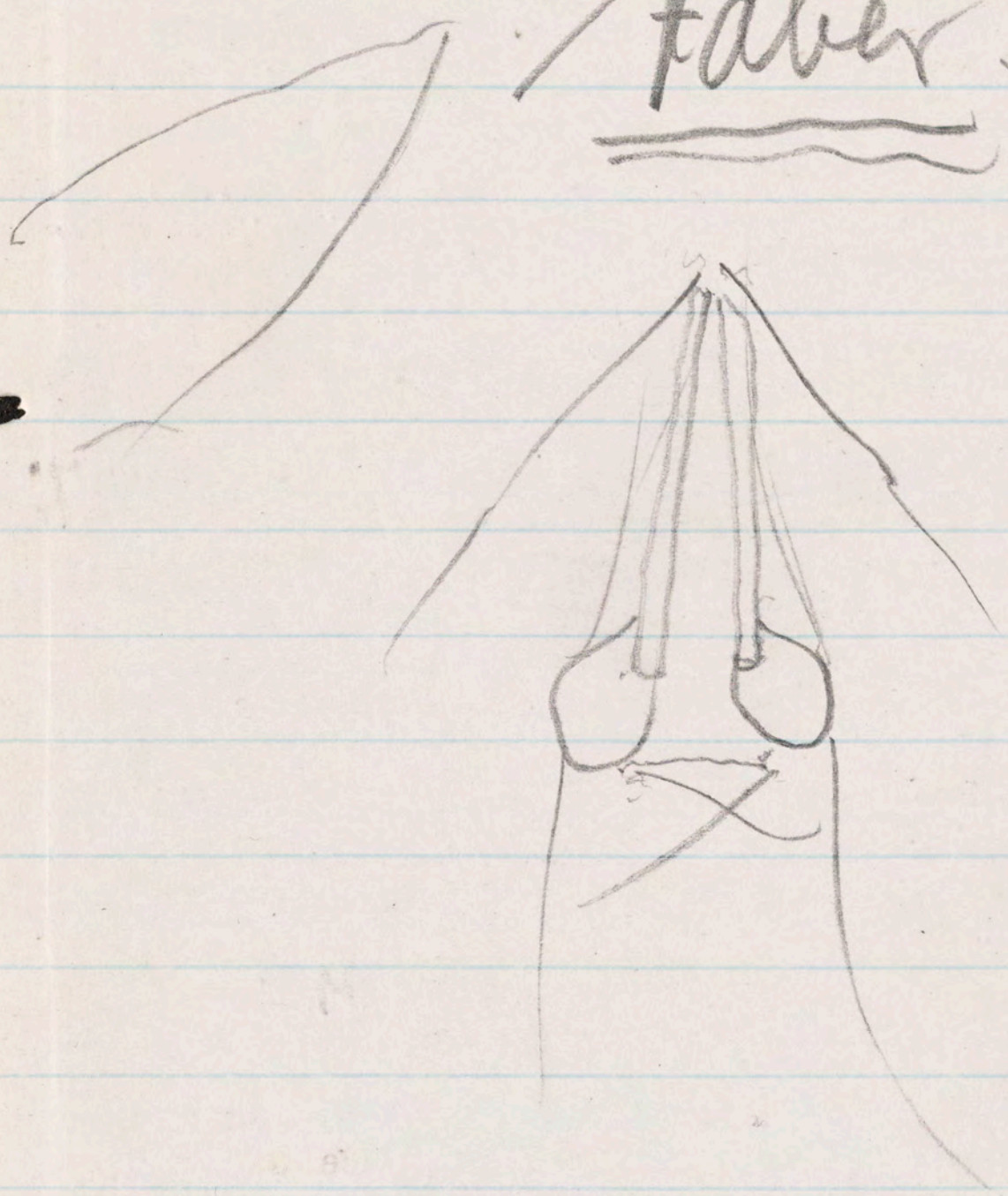


THE LARYNX OPENED.—7. Superior vocal ligaments. 8. Thyroid cartilage. 9. Ventricle of Galen. 10. Inferior vocal ligament. 11. Arytenoid cartilages. 12. Cricoid cartilage.

"There are two kinds of male voice, the bass and tenor, and two kinds of female voice, the contr'alto and soprano. The bass voice usually reaches lower than the tenor, and its strength lies in the low notes; while the tenor extends higher than the bass. The contr'alto has generally lower notes than the soprano, and is strongest in the lower notes of the female voice, while the soprano voice reaches higher in the scale. But the difference of compass, and of power in different parts of the scale, are not the essential distinctions between them. The important difference consists in their tone or 'timbre,' which distinguishes them even when they are singing the same note. The qualities of the barytone and mezzo-soprano voices are less marked, the barytone being intermediate between the bass and tenor; the mezzo-soprano between the contr'alto and soprano." (*Kirkes.*)

In each octave there are twelve semitones. Within each semitone at least six different notes can be produced; 120 notes or more can, then, be made distinctly by an ordinary singer. Yet the vocal ligaments vary in length but $\frac{1}{5}$ of an inch. Each note

Faber



Lee Seiler

B

27

Articulation.

Development,

Growth,

Senescence.

V

ch

ah a

aa

a a

aw

e a

i a

o a

oh a

uh

oo

C

B as

G as

M as

St

T as

C

Com

Tsh as

Kw a

Simple

Distinct English Sounds.

Vowel-sounds:

eh as in net
ah as in fat
aa as in calm
a as in father
aw as in claw
e as in see
i as in pin
o as in not
oh as in go (uh-oo?)
uh as in hut
oo as in too

Compound vowel-sounds:

eh-e (a) in fate
a-e (i) in mite
e-oo (u) in repute
o-e (oi) in point
(e-eh (y) in yet)
ah-oo (ou) in gout

Consonant-sounds:

B as in bat — S as in cease — D as in do — F as in far
G as in go — H as in high — K as in king — L as in let.
M as in man — N as in no — P as in Pen — R as in run
Sh as in she — Th as in thou
T as in top — V as in vine — W as in we — Z as in zinc

Compound consonant sounds:

Eeh as in yet, vowel;
Dsh as in Dshordsh (George)
Tsh as in Church —
Kw as in Kweer (Queer) Ks as in fiks (fix) — Gs as in Egzert
Eeh as in yet.

oo, e, ih, ch, uh, ŏh, ah, au.

Two, three, six, set,
but, not, bat, ball:

a is ehe; i is ahe;
o is uh oo, mostly; but can
be pronounced continuously.

requires, therefore, a variation in the state of the ligaments of but $\frac{1}{600}$ of an inch. In falsetto notes, it would appear that only the edges of the vocal cords approach each other.

The lungs are the *wind-box* of the vocal organ; the manner in which air is impelled through the larynx making much difference in vocalization. The solid and flexible structures of the mouth and nostrils also affect and modify it considerably.

For speech, *articulation* as well as voice is necessary. In this, the tongue, palate, lips, and teeth are employed. Besides the *vowel* sounds, some of which may be continuously pronounced—as ah, au, e, eh, ih, uh, oo, while others are compound, as a, i, o, oi, ow, yu, the *consonants* are by some writers divided into *linguals*, *dentals*, *labials*, &c. These distinctions are not very accurate. The tongue is used in c, hard and soft, d, g, hard and soft, h, j, k, l, n, q, r, s, t, x, y, z. The lips especially in b, p, f, m, v, w. The teeth are expressly touched by the tongue in s, z, and th. Reverberation in the nasal cavities occurs in the *prolonged* sound of b, d, g, l, m, n, r, v, w, y, z, and also in certain compound sounds, as ng. In other languages than the English, many sounds exist which no combination of our letters is capable of expressing.

Stammering is owing to a want of control of the will over the muscles of articulation. It is to be treated and cured, therefore, by systematic and well devised *vocal gymnastics;* instruments afford only very slight palliation for it.

CHAPTER IX.

DEVELOPMENT.

CONCEPTION.

Actual contact of the spermatozoa and ovule is necessary for impregnation; more than this, according to recent observers, not only contact but penetration of the ovule by the spermatozoa. Barry, Nelson, Keber, and others have seen spermatozoa inside the ovule in various animals. In most, if not all cases, there appears to be a penetration by many of them. Spermatozoa, at the same time, pass through the coats of the vitellus, and, massing around the germ cell, lose their motor power, become disintegrated and disappear, after having awakened the germ to its wonderful life.

THE EMBRYO.

The first change in the ovule (henceforth known as the ovum) is cleavage or segmentation of the yelk. The embryo cell elon-

gates, becomes somewhat fiddle shaped, divides into two cells by the ordinary process of cell division. At the same time the yelk divides into two parts, so that each cell is contained in its own separate yelk mass. By repetition of this process we have 4—8—16 cells and yelk masses formed, and so on until segmentation is completed, and out of the germ cell and yelk is formed a homogeneous mass of cells—the *germ mass.* During this, there has been an evident increase of cells at the expense of the yelk.

After the formation of the germ mass the cells nearest the surface immediately under the zona pellucida or vitellary membrane become aggregated to form a membrane, the so-called *germinal membrane*, which soon divides itself into the external or *serous layer* and the internal or *mucous layer*, between which the other germinal cells are collected forming the *vascular layer.* The first of these gives origin to the vertebral column, skull, extremities, nerves, general skeleton, brain, and spinal cord. In the second the glands and mucous structures are formed, whilst the vascular system, including the heart, originates in the intervening layer—the vascular. Soon there is an evident thickening at one end of this fourfold ball, as it were ; a heaping together of cells, and the dense area thus formed receives the name of *area germinativa*, which is first roundish, then oval, then pyriform. In the centre of this, which is of course made up of three layers, the cells of the serous and mucous layers become comparatively few in number, and a semitransparent spot is thus caused, the so-called *area pellucida*, which is bounded laterally by an accumulation of the cells of the vascular layer, the *area vasculosa.* In the serous lamina, in the centre of the *area pellucida*, appears soon the *primitive trace*, a transparent groove, the first sign of the fœtus. It is surrounded above by two ridges, the *laminæ dorsales ;* which, during development, arch over the groove and finally unite above, enclosing the groove in which the cerebro-spinal nerve-centres are afterwards formed, whilst the laminæ are transformed into the spinal column and skull.

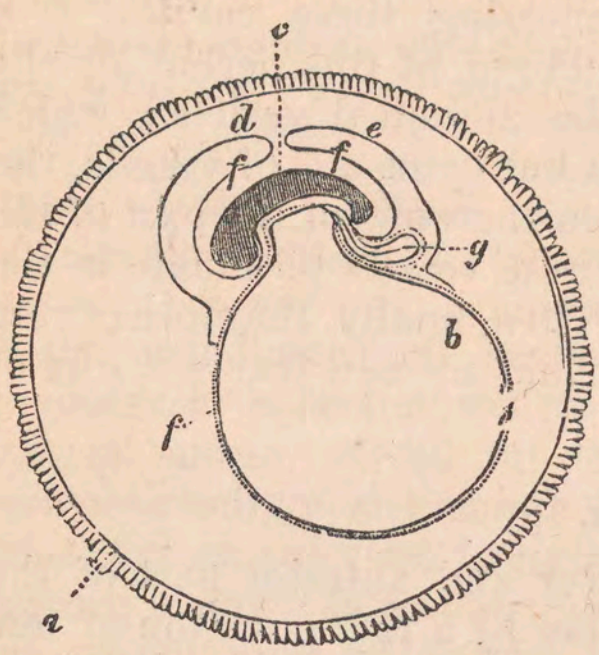
In the same way two ridges grow out below the primitive trace, arch over (or rather under) and unite, thus forming the abdominal cavity of the fœtus. These are the *laminæ ventrales.* It is readily seen that if either the dorsal or ventral laminæ fail to unite, there will result a monstrous fœtus ; if it be the former which do not join, the spinal column will be incomplete, and *spina bifida* will occur ; if the latter, the anterior part of the body will be incomplete, and *hare-lip, cleft palate*, or other malformation dependent on insufficient development of the walls of the chest or abdomen will be present. In the area vasculosa, which is inclosed in the laminæ ventrales, the bloodvessels are formed by the union of rows of cells, and obliteration of their separating walls ; their nuclei

(according to Dr. Carpenter) forming the blood disks. In like manner the heart is formed after the vessels; the first flow of blood is towards the heart, the so called *punctum saliens* (Fig. 163.)

Amnion.

The *amnion*, the essential envelope of the ovum, appears very early in the formation of the embryo. A little beyond the extremities of the ovum, on the outside of the area pellucida, the serous lamina projects in two hollow processes, which arch over the dorsum of the embryo and unite to inclose it. At first these two processes are widely separated in their central portion; but soon they spread also over the ventral surface of the embryo, and ultimately surround the elements of the umbilical cord: of the two layers, which thus form the amnion, the outer becomes adherent to the external or maternal membrane, the other constitutes the especial envelope of the fœtus.

Fig. 161.



THE AMNION AND CHORION.—*a*. Chorion. *b*. Umbilical vesicle, surrounded by the serous and vascular laminæ. *c*. Embryo. *d*, *e*, and *f*. External and internal folds of the serous layer, forming the amnion. *g*. Incipient allantois.

Fig. 162.

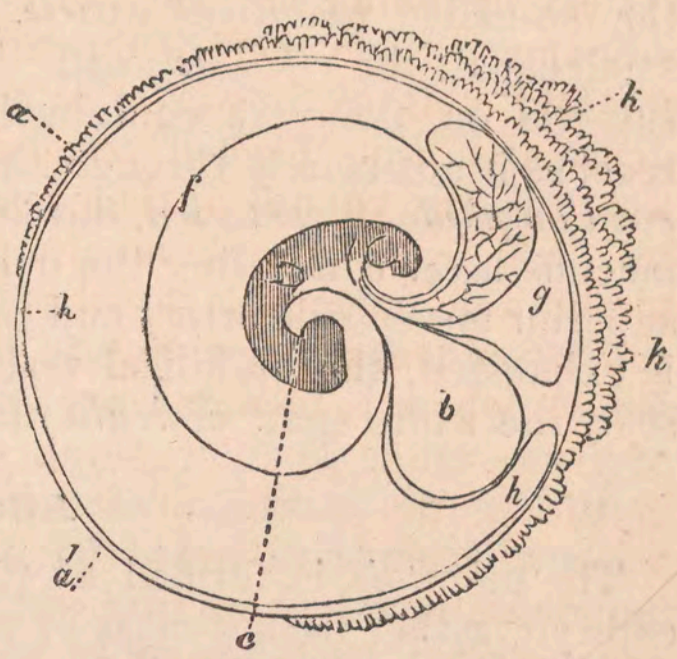


DIAGRAM REPRESENTING A HUMAN OVUM IN SECOND MONTH.—*a* 1. Smooth portion of chorion. *a* 2. Villous portion of chorion. *k*, *k*. Elongated villi, beginning to collect into placenta. *b*. Yelk sac, or umbilical vesicle. *c*. Embryo. *f*. Amnion (inner layer). *g*. Allantois. *h*. Outer layer of amnion, coalescing with chorion.

The membrane thus formed embraces the embryo very closely at an early period, and is continuous with the common integument of the fœtus, at the open abdominal parietes. At a later period it is distended with fluid, and so separated from the fœtus, and after being reflected upon the funis, of which it forms the outer coat, it terminates at the umbilicus. It is thin and transparent, but of a firm texture, resisting laceration much more than the other membranes. Its external surface is somewhat flocculent, but

internally it is quite smooth, like serous membrane, and like it secretes a bland fluid. This fluid resembles dilute serum, and is called *liquor amnii.* It varies in amount from half a pint to several quarts, the average quantity being about half a pound. It subserves several useful ends. It probably serves as nutriment to the fœtus during the early months; it preserves an equable temperature for it while remaining in utero; it protects it from the effects of sudden blows, shocks, etc. It is also useful in dilating the os uteri, by protruding the membranes in the commencement of labor.

It will be remembered that the mucous layer is the most internal, being that which immediately surrounds and contains the yelk. The first change in it is the appearance of a constriction caused by the growing from it, towards the centre of the yelk, of a pair of processes, which increase in size until they finally meet and divide the cavity of the mucous layer into two; in the smaller of these, the one next to the embryo, the mucous membranes, glands, etc., are developed, whilst the larger consists largely of the yelk and is the so-called *umbilical vesicle.* Connecting these cavities is a small canal, the *vitelline duct.* The embryo, at this period, chiefly subsists on the yelk contained in the umbilical vesicle; which reaches it not merely through the duct but by means of vessels, the *vasa omphalo-mesenterica*, developed on the walls of the part of the mucous layer composing the duct. These vessels terminate in the superior mesenteric artery and vein. When, finally, the store of yelk is exhausted, the umbilical vesicle shrinks up and leaves a sort of scar, the white spot, *vesicula alba.*

Allantois.

The *allantois* is formed at the lower and anterior part of the embryo, rather from a mass of cells than by a reduplication of one of the primary layers. It is at first a delicate membranous elongated sac, but, like the cavity of the mucous layer, it is divided into two by constriction. The smaller of these divisions becomes the urinary bladder, the other, the allantois proper. The *urachus* of the perfected animal (the cord leading from the bladder to the umbilicus) is the remains of the duct connecting the fœtal bladder with the allantois. The allantois extends itself until at last it comes in contact with the uterine surface. Its further history will be traced directly.

The Decidua.

While this development has been going on, certain changes have taken place in the uterus, which it is now necessary to notice. The earliest change in this organ after impregnation consists in an enlargement of the tubular glands of the mucous membrane, and of the capillaries between them; the glands becoming visible

Fig. 163.

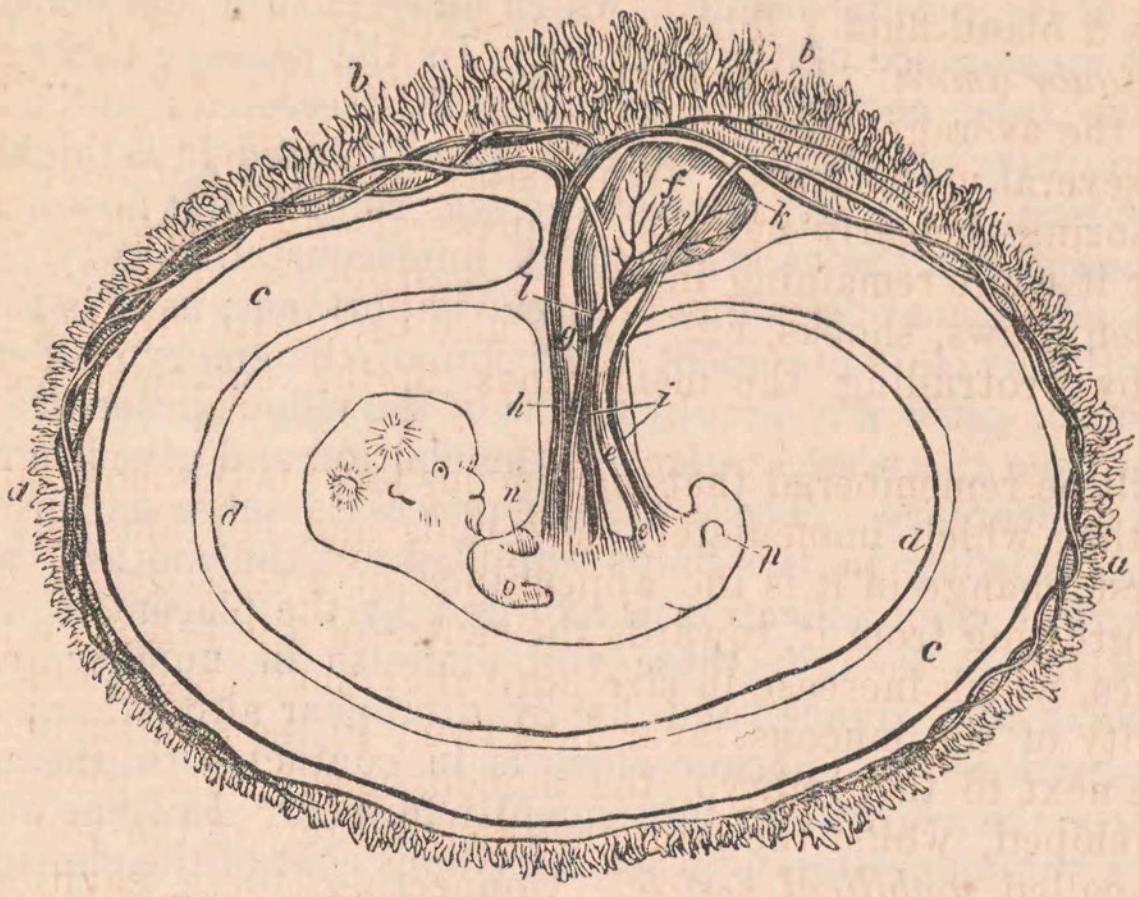


DIAGRAM OF THE FŒTUS AND MEMBRANES ABOUT THE SIXTH WEEK. FROM CARUS.—*a.* Chorion. *b.* The larger absorbent extremities, the site of the placenta. *c.* Allantois. *d.* Amnion. *e.* Urachus. *e.* Bladder. *f.* Vesicula umbilicalis. *g.* Communicating canal between the vesicula umbilicalis and intestine. *h.* Vena umbilicalis. *i, i.* Arteria umbilicalis. *l.* Vena omphalo-mesenterica. *k.* Arteria omphalo-mesenterica. *n.* Heart. *o.* Rudiment of superior extremity. *p.* Rudiment of lower extremity.

to the naked eye, and pouring out profusely a peculiar secretion of albuminous matter and cells. These together, *i. e.*, the entire altered mucous membrane of the uterus, constitute the *decidua vera* which lines the cavity of the uterus. According to Coste, the ovum on entering the uterus is imbedded in the soft altered mucous membrane, and as it were sinks into it, the latter throwing out granulations which arch over the ovum and form a membrane covering it, *decidua reflexa.* Other authorities have believed that this membrane arises as follows: by the time the ovum reaches the uterine orifice of the Fallopian tube, the uterine mucous membrane has become so swollen as completely to occlude it, so that the ovum necessarily in entering the uterus pushes before a part of the mucous membrane which constitutes the membrana reflexa. It will be seen that there is therefore a double membrane; one part of which lines the uterus, the decidua vera; the other enwraps the fœtus, the decidua reflexa; the whole of which constitutes the *membrana decidua,* so called, because cast off at the birth of the child.

Chorion.

The *chorion* is another envelope of the fœtus obtained from the mother and partially formed before the ovum arrives at the

uterus. When the ovum leaves the ovary it is enveloped in a portion of the proliferous disk, which adheres to it and constitutes the first appearance of the chorion. In the passage through the Fallopian tube, new gelatinous material is secreted; until, by the time the ovum arrives at the uterus, it is inclosed in a thick membrane, which, at its first appearance, was smooth, but now is rough and shaggy from the enlargement of numerous villi.

This new formation is one of great importance, as it is through it that the whole subsequent nutrition of the embryo is derived; this is accomplished at first by means of the villous processes which proceed from the whole surface of the chorion and give it a rough, shaggy appearance. These villous processes serve as absorbing radicles, drawing in the fluids supplied by the mother, until a more perfect communication is afforded by the placenta. As the ovum advances in age, these villi diminish in number, assume a vesicular appearance, and finally disappear altogether; *except* at that part of the chorion which is in contact with the uterus, and where the *placenta* is subsequently formed. In some animals, this original connection between the villous coat of the chorion and the uterine surface is the only one that exists; hence they are called *non-placental.*

Placenta.

It will be remembered that we left the allantois passing out of the umbilicus towards the maternal organs. By the time it reaches the decidua reflexa, this, as well as the decidua vera, has become much thickened at the spot which it touches, and the villi of the chorion have there become remarkably enlarged. The placenta is thus formed, by the fusion of the chorion and decidua; the former being connected by the allantois with the ovum. The villi of the placenta are the villi of the chorion capped by the decidua. The human placenta, at full term, is of a soft spongy texture, round or slightly oval, from six to eight inches in diameter and from one to two inches thick; its fœtal or inner surface covered by the amnion is smooth, and generally has the umbilical cord inserted near its centre; sometimes to one side, when it is known as the *battledore* placenta. The external or maternal face of the cast-off placenta is seen to be divided somewhat irregularly into lobes, and covered by the hypertrophic mucous membrane of the uterus, into which the tufts of the chorion have penetrated. The placenta is destitute of nerves and lymphatics, and is in its structure essentially vascular. It will be seen that there are two parts to it; the fœtal and maternal.

The *fœtal* portion of the placenta consists of the branches of the umbilical vessels, which divide minutely where they enter the organ, and constitute by their ramifications a large portion of its substance; each subdivision terminating in a villus. Each villus

contains a capillary vessel, which forms a series of loops, communicating with an artery on one side and with a vein on the other. The vessels of the villi are covered by a layer of cells inclosed in basement membrane. The *maternal* portion may be considered as a large sac, consisting of a prolongation of the internal coat of the great uterine vessels. Against the fœtal surface of this sac the placental tufts push themselves, dipping down into it and carrying before them a portion of its thin wall, so as to constitute a sheath to each tuft. The blood is conveyed into the cavity of the placenta by the "curling arteries," so named from their tortuous course, which proceed from the arteries of the uterus, and the blood is returned through large uterine veins called *sinuses.* It must not, however, be understood that there is any direct communication between the vessels of the fœtus and those of the mother, the fœtal tufts being merely *bathed* in the maternal blood and drawing nourishment from it by cells, which have the power of selecting, and of elaborating their own materials. The placenta performs the threefold office of an absorbing, respiratory, and excreting organ. It begins to be formed about the end of the second month; acquires its peculiar character during the third, and goes on increasing in proportion to the development of the ovum.

Umbilical Cord.

The *umbilical cord* is formed from a portion of the allantois; it connects the fœtus to the placenta and affords a passage to the blood from one to the other. It contains two umbilical arteries, and one umbilical vein, the duct of the umbilical vesicle, the omphalo-mesenteric vessels, the urachus, and sometimes more or less of the intestinal canal, the whole imbedded in the *Whartonian jelly*, and invested by a reflection from the amnion. Its length varies much; the average, however, is about eighteen inches. Sometimes it is so short as seriously to impede the progress of labor.

FŒTAL GROWTH.

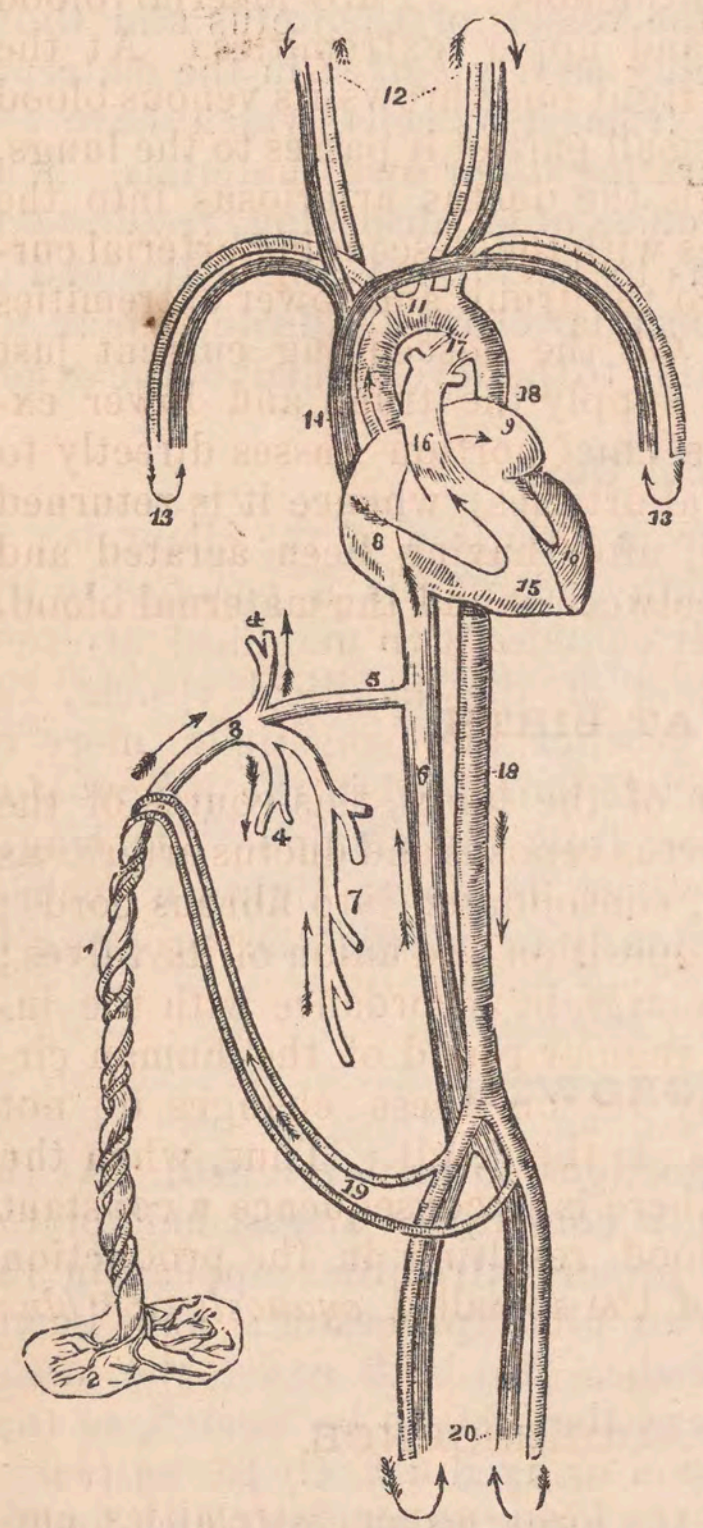
The head is one of the first portions to be developed. At the beginning of the second month, it constitutes almost half of the entire mass of the fœtus. The upper extremities appear in the early part of the fifth week, as two blunt processes; and, immediately afterwards, the lower limbs. In both cases, the distal parts, *i. e.*, the hands and feet, are the first to be formed, so that they appear, as it were, sessile upon or fixed directly to the trunk; then the parts next to these, *i. e.*, the forearms and legs, and, finally, the arms and thighs. The motions of the child are rarely perceptible before the third month, and the beating of the heart is generally first heard during the fifth month. The average length of a full-

grown child at birth, is about eighteen inches; the weight varies from four to eighteen pounds; the average probably being seven or eight pounds—a male weighing about one pound more than a female.

Circulation of the Fœtus.—There are some peculiarities in this. The chief are owing to the presence of the foramen ovale and ductus arteriosus in the thorax, umbilical artery and vein and the ductus venosus in the abdomem.

The *foramen ovale* is an opening between the two auricles of the heart, allowing the blood to pass freely from one to the other. The *ductus arteriosus* arises from the pulmonary artery near its origin,

Fig. 164.



THE FŒTAL CIRCULATION.—1. The umbilical cord, consisting of the umbilical vein and two umbilical arteries, proceeding from the placenta (2). 3. The umbilical vein dividing into three branches; two (4, 4) to be distributed to the liver; and one (5) the ductus venosus, which enters the inferior vena cava (6). 7. The portal vein, returning the blood from the intestines, and uniting with the right hepatic branch. 8. The right auricle: the course of the blood is denoted by the arrow, proceeding from 8 to 9, the left auricle. 10. The left ventricle: the blood following the arrow to the arch of the aorta (11), to be distributed through the branches given off by the arch to the head and upper extremities. The arrows 12 and 13 represent the return of the blood from the head and upper extremities through the jugular and subclavian veins, to the superior vena cava (14), to the right auricle (8), and in the course of the arrow through the right ventricle (15) to the pulmonary artery (16). 17. The ductus arteriosus, which appears to be a proper continuation of the pulmonary artery—the offsets at each side are the right and left pulmonary artery cut off; these are of extremely small size as compared with the ductus arteriosus. The ductus arteriosus joins the descending aorta (18, 18) which divides into the common iliacs, and these into the internal iliacs, which become the umbilical arteries (19), and return the blood along the umbilical cord to the placenta; while the other divisions the external iliacs (20) are continued into the lower extremities. The arrows at the termination of these vessels mark the return of the venous blood by the veins to the inferior cava.

and conducts the blood from the right auricle to the aorta, into which it empties just below the arch. The *ductus venosus* passes from the umbilical vein to the vena cava ascendens along the thick edge of the liver.

The following is the course of the blood: It is conveyed from the placenta along the umbilical vein, partly, at once, to the vena cava ascendens by means of the ductus venosus, partly into the liver, whence it reaches the vena cava by the hepatic vein. Having passed through the two great fœtal depurating organs (liver and placenta) it is in the state of arterial blood. It enters the right auricle; but, being directed through the foramen ovale by the Eustachian valve, arrives at the left auricle, thence goes to the left ventricle, and is thrown out into the aorta. Pure arterial blood is, therefore, sent to the head and upper extremities. At the contraction of the ventricles, the right one throws its venous blood into the pulmonary artery; but a small part of it passes to the lungs, the greater portion going through the ductus arteriosus into the descending aorta, where it mingles with the descending arterial current. Thus the blood supplied to the trunk and lower extremities is mixed arterial and venous. Of the descending current just spoken of, a small part goes to supply the trunk and lower extremities with nutriment, but the chief portion passes directly to the placenta through the umbilical arteries; whence it is returned by means of the umbilical vein, after having been aerated and nourished by endosmotic action between it and the maternal blood.

CHANGES AT BIRTH.

After birth and the expansion of the lungs, this course of the blood is entirely changed. The ductus venosus and ductus arteriosus become impermeable, and, finally, consolidated into fibrous cords; the foramen ovale closes, by the apposition and union of its valves; the pulmonary artery and vein enlarge in accordance with the increase of their function, and the regular round of the human circulation commences. If for any reason these changes do not take place, serious organic disease is the result. Thus, when the foramen ovale remains patulous, there is in consequence a constant mixture of arterial and venous blood, resulting in the production of the well-known phenomenon of the so-called *cyanosis* or "*blue disease.*"[1]

INFANCY AND ADOLESCENCE.

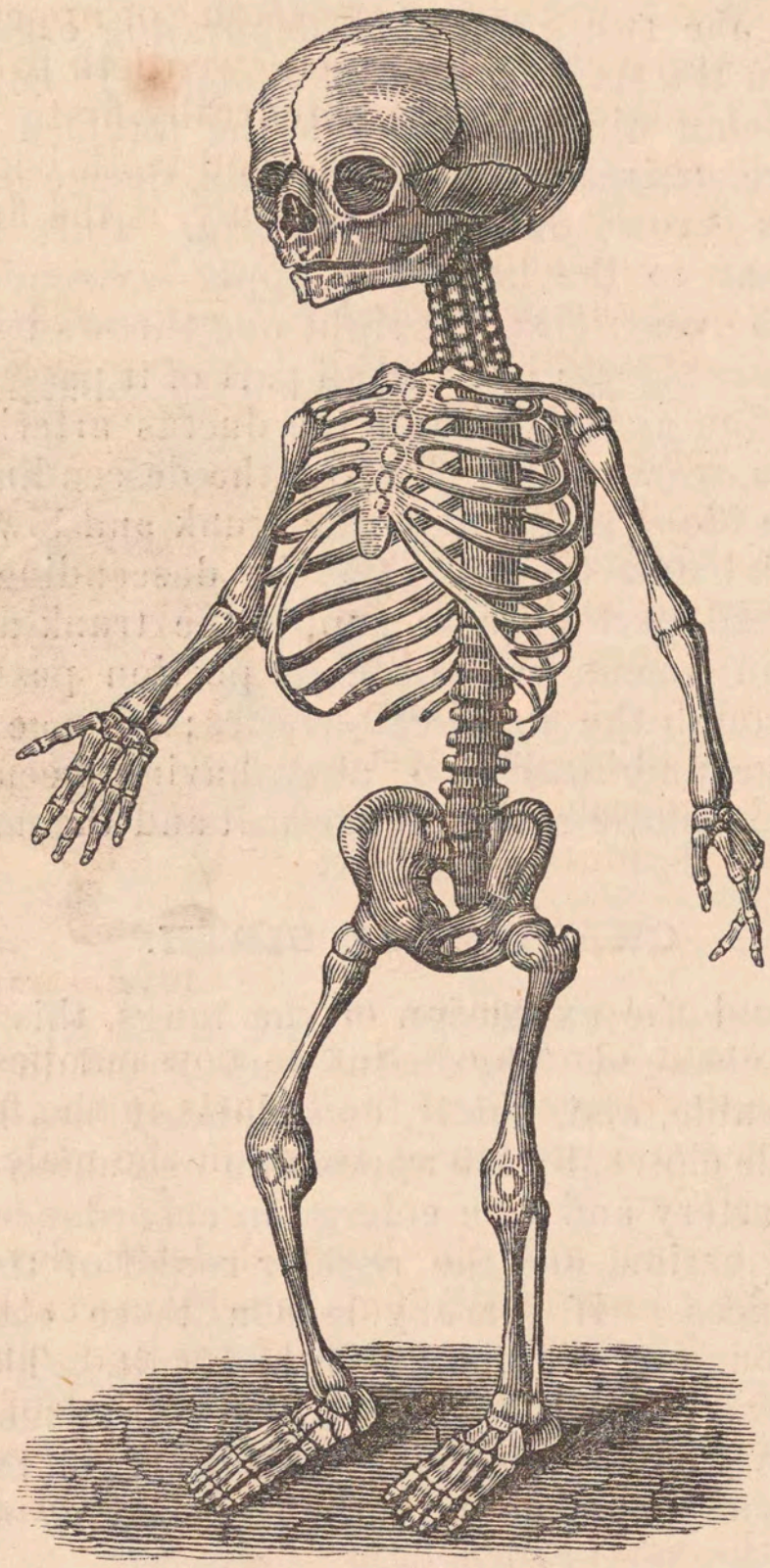
A new-born child has a very large head, upper extremities and abdomen, in proportion to its pelvis and lower limbs. The umbi-

[1] Produced also by insufficient enlargement of the pulmonary artery.

licus is nearly at the middle of its body. Gradually all the parts approach to the perfect symmetry of adolescence and maturity.

Breathing by the lungs is less active, and that by the skin more so, in infancy than later in life. The power of generating animal heat is less, and the need of protection or communicated heat

Fig. 165.



FŒTAL SKELETON.

much greater at that time than afterwards. The skin and alimentary canal are extremely delicate and impressible. Kölliker states that all the hairs of the head and body are renewed in the first year.

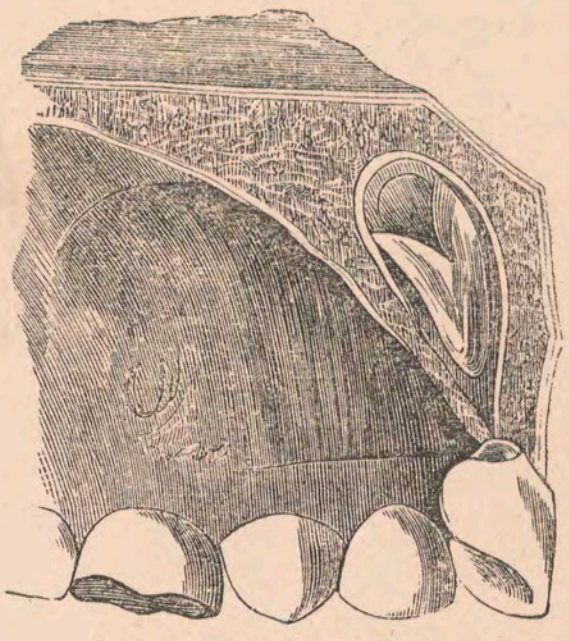
Of the nervous system, the organic or ganglionic (sympathetic) and spinal reflex apparatus are most nearly mature at birth. Excito-

motor involuntary actions are predominant over those of purpose and will, throughout childhood. Convulsions are more readily produced by irritating causes in infants and children than in adults.

At birth, the twenty first teeth are partly formed in both jaws, but beneath the gums. The following is the usual order of their protrusion or "cutting." Two central incisors, in each jaw, in the seventh month; two lateral incisors, eighth month; two anterior molars (first jaw teeth), end of twelfth month; two canines ("stomach teeth" of lower jaw, "eye-teeth" of upper), eighteenth month; two second molars or jaw teeth, twentieth to twenty-fourth month. Those of the lower jaw are generally first.

At about seven years of age, the second teeth begin to replace the others. The first to appear, commonly, is the first permanent molar tooth, at six years and a half. Next, at seven years, the permanent middle incisors. At eight, the lateral incisors follow. The first and second bicuspids before ten years of age. The four canines, upper and lower, before twelve. At thirteen, the second permanent molars. The third and last molars ("wisdom teeth") between seventeen and twenty-one; making in all thirty-two teeth of the second set; in each jaw, four incisors, two canines, four bicuspids, and six molars.

Fig. 166.



DEVELOPMENT OF TEETH.

The age of *puberty*, from fourteen to sixteen in temperate climates, is marked by important changes. Sex is now manifested, by menstruation and the development of the breasts in the female, and by the change of voice and growth of beard in the male. Emotional differences also appear.

The muscular system and the bony skeleton develop progressively from infancy to maturity. This is seldom reached before the twenty-fifth year. The osseous union of the ends and shafts, epiphyses and diaphyses of the long bones, and that of the different bones of the head, may sometimes be incomplete even to a later period; and, according to some anatomists, the brain may grow until forty, and the heart still longer.

The following table, from Dalton, exhibits the comparative proportion of different organs to the whole body, at birth and maturity:—

	Fœtus at term.	Adult.
Weight of entire body	1000.00	1000.00
" Thymus gland	3.00	0.00
" Thyroid "	0.60	0.51
" Renal capsules	1.63	0.13
" Kidneys	6.00	4.00
" Heart	7.77	4.17
" Liver	37.00	29.00
" Brain	148.00	23.00

Old age is shown by general *atrophy* or failure of nutrition as well as of power; frequently attended by various forms of degeneration of structure and defective functional action, tending towards death.

New words — Hrbs

Post-organic

Organo-taxis

Dividual

~~(Unwisdom)~~

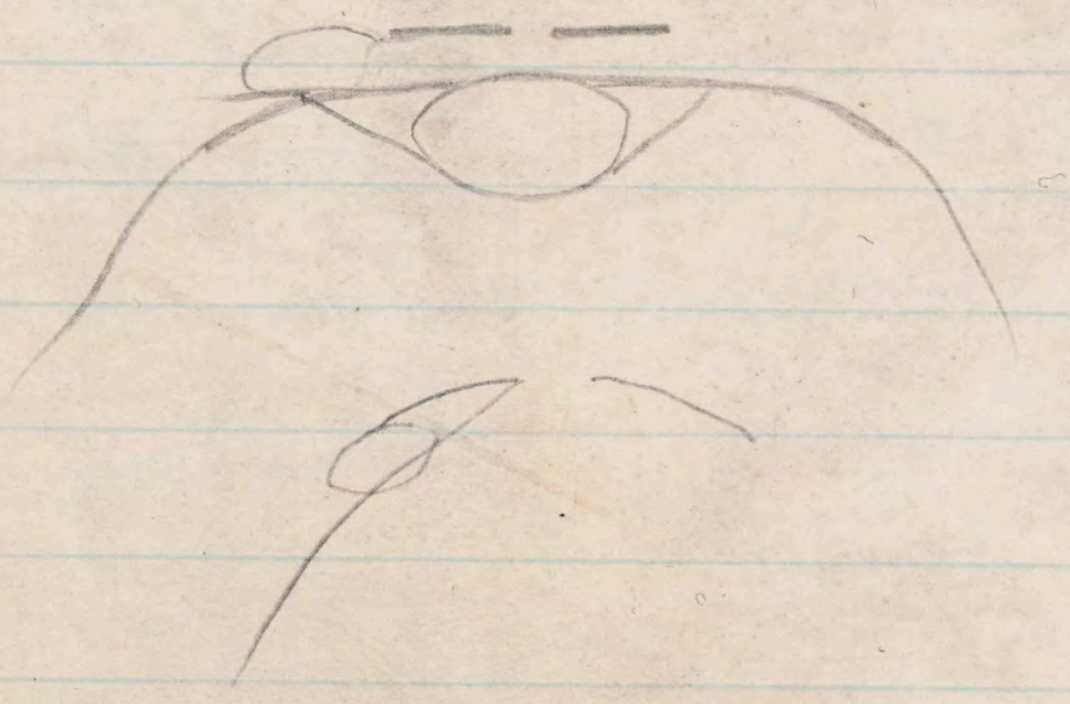
~~Ignorance~~ (Nescience)

~~Dividual~~

Estuition

~~Supraspect?~~

~~Atheophanism~~



C. L. Fisher

Overhoff